

# The Mining Journal

Established 1835

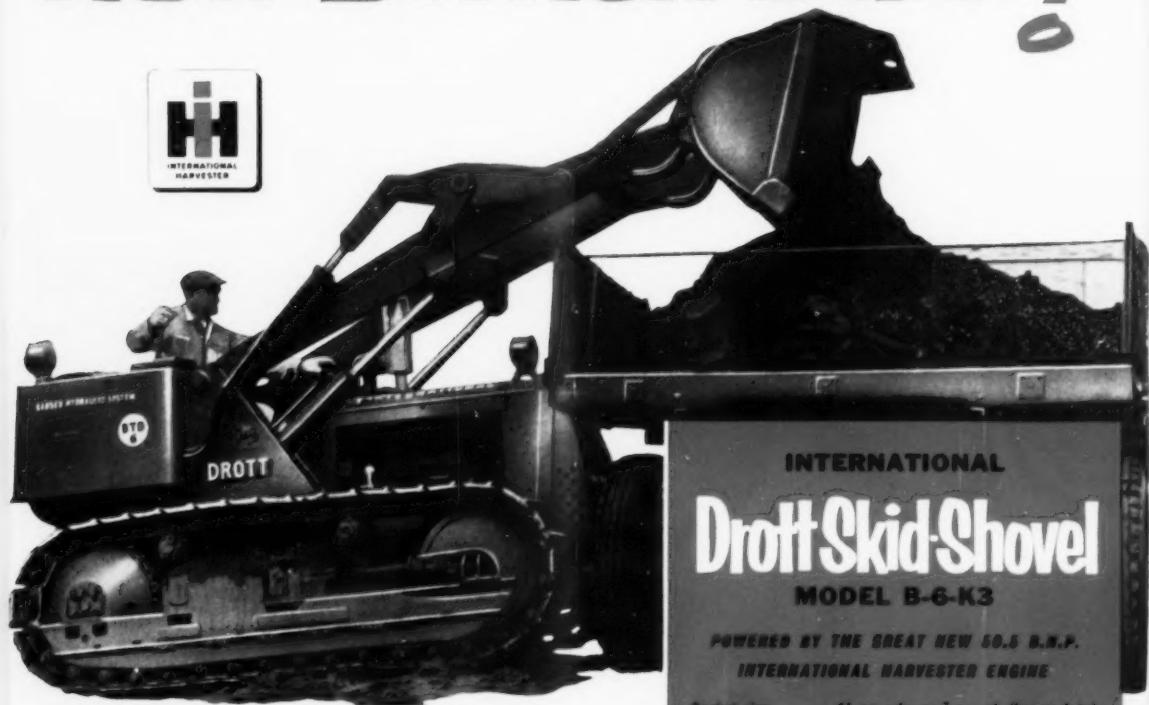
Railway & Commercial Gazette

Vol. CCXLVI No. 6287

LONDON, FEBRUARY 17, 1956

PRICE 9d.

## WORLD'S LEADING LOADER Now British Built!



There's never been a loader that digs with such force, carries with such ease, lifts so high and reaches so far as the International Drott. Never a loader so strong, so simple and safe, so widely acclaimed. The fact that production has extended to Britain is proof enough of that. If you've not yet seen the International Drott, you should lose no time in contacting your International Industrial Dealer.



### INTERNATIONAL

## Drott Skid-Shovel MODEL B-6-K3

POWERED BY THE GREAT NEW 50.5 B.H.P.  
INTERNATIONAL HARVESTER ENGINE

Bucket size.....	1½ cu. yds. or ½ cu. yd. (heavy duty)
Digging depth below ground line.....	11 ins.
Lifting capacity.....	3,000 lbs.
Leading height (to bucket hinge pin).....	9 ft. 11 ins.
Max. forward pitch.....	66 ins.

### 4 Special features put this loader yards ahead!

**PRY-OVER-SHOE BREAK-OUT** ie. bucket roll-back! 8,500 lbs. digging force!

**SKID-SHOE TRANSPORTATION** Faster, easier, safer. Prevents 'carry strain' on tractor.

#### REVERSE CYLINDER ACTION

Greater power for digging and lifting. Higher speed for dumping and lowering.

#### HYDRO-SPRING SHOCK ABSORBER

Cuts hydraulic shocks by two-thirds. Safeguards operator, tractor and loader.

**International** INDUSTRIAL POWER

**International**  
Industrial Dealers in Gt. Britain and N. Ireland

**JAMES BOWEN & SONS LTD.**  
EDINBURGH, GLASGOW AND ABERDEEN

**R. CRIPPS & CO. LTD.**  
NOTTINGHAM & SHILDON

**SAVILLE TRACTORS LTD.**  
LONDON & STRATFORD-ON-AVON

**SAVILLE TRACTORS (BELFAST) LTD.**  
BELFAST

**WESTERN CONTRACTORS SERVICES LTD.**  
BRISTOL

INTERNATIONAL HARVESTER COMPANY OF GREAT BRITAIN LIMITED, HARVESTER HOUSE, 259 CITY ROAD, LONDON E.C.1

NON-FERROUS METALS  
METALLIC RESIDUES  
METAL SCRAP  
FERRO ALLOYS



MANGANESE  
CHROME  
ZINC  
LEAD  
COPPER  
TUNGSTEN

**TANTALUM - COLUMBIUM**

**and all other Non-Ferrous Ores and Minerals**

*Philip Brothers, Inc.*

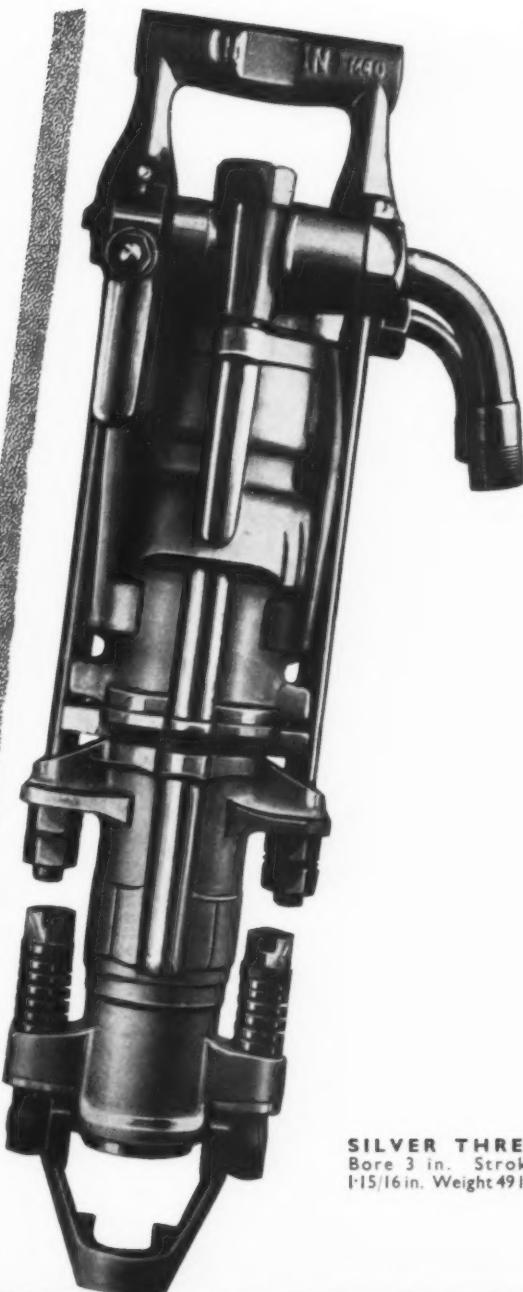
**70 Pine Street, New York 5, N. Y.**

Cables: PHIBRO  
New York 5, N. Y.

AMSTERDAM • TOKYO • MONTREAL  
BUENOS AIRES • MONTEVIDEO  
LIMA • LA PAZ • CALCUTTA • BOMBAY  
ENGLAND • PORTUGAL • SPAIN

*The NEW*  
**Holman**  
**SILVER THREE**  
*gives you*  
**MORE POWER**  
**PER POUND!**

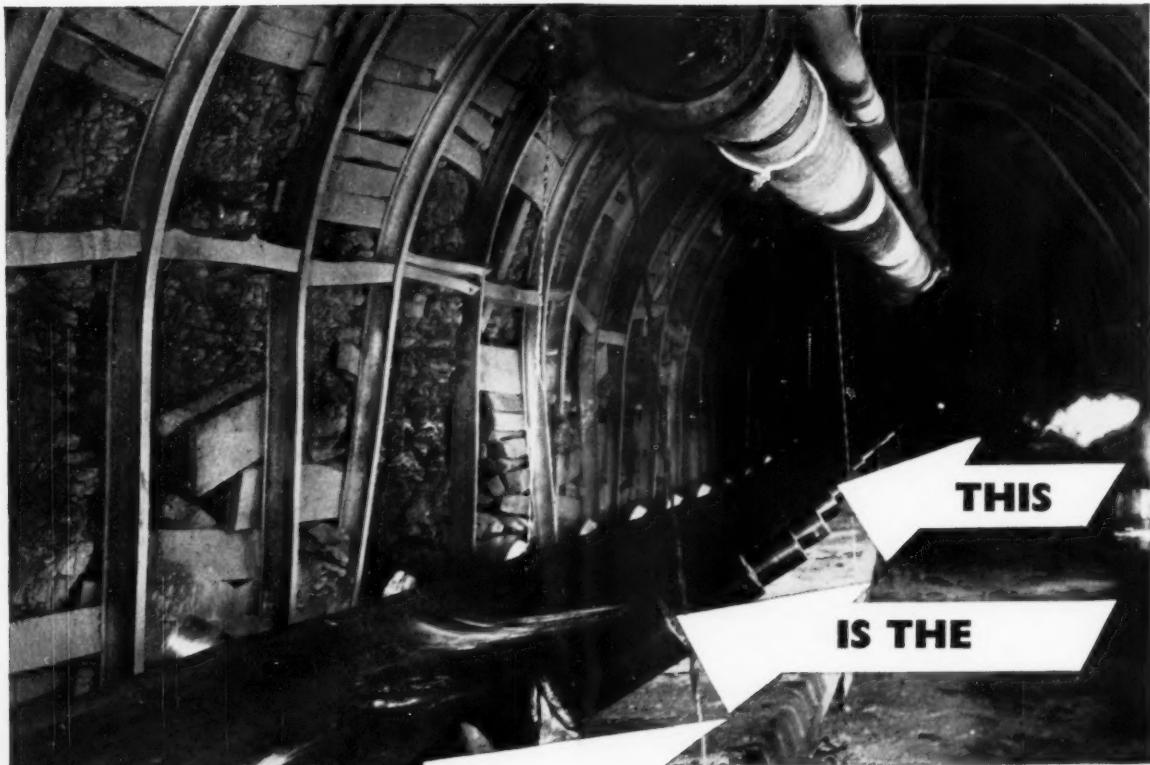
Acclaimed by the mining world, the Holman Silver Three has already proved itself to be in a class of its own. An entirely new Holman design, this medium light-weight rock drill has solved the twin problems of toughness versus light weight and high speed versus long life. With the Silver Three you get all these plus easy handling, reliability and economical air consumption. Mounted on the world-famous Holman Airleg, the Silver Three is today's finest drill for raising output. It will pay you to find out more about it.



**SILVER THREE**  
Bore 3 in. Stroke  
15/16 in. Weight 49 lb.

**ROCK DRILLS**  
**AIR COMPRESSORS**  
**PNEUMATIC TOOLS**

**Holman**



**BELT** This is the P.V.C. belt for which the National Coal Board granted fireproof approval No. 1. First installed at Manvers Main in 1948 it has continued to give unrivalled service in mines throughout the country.

# SCANDURA

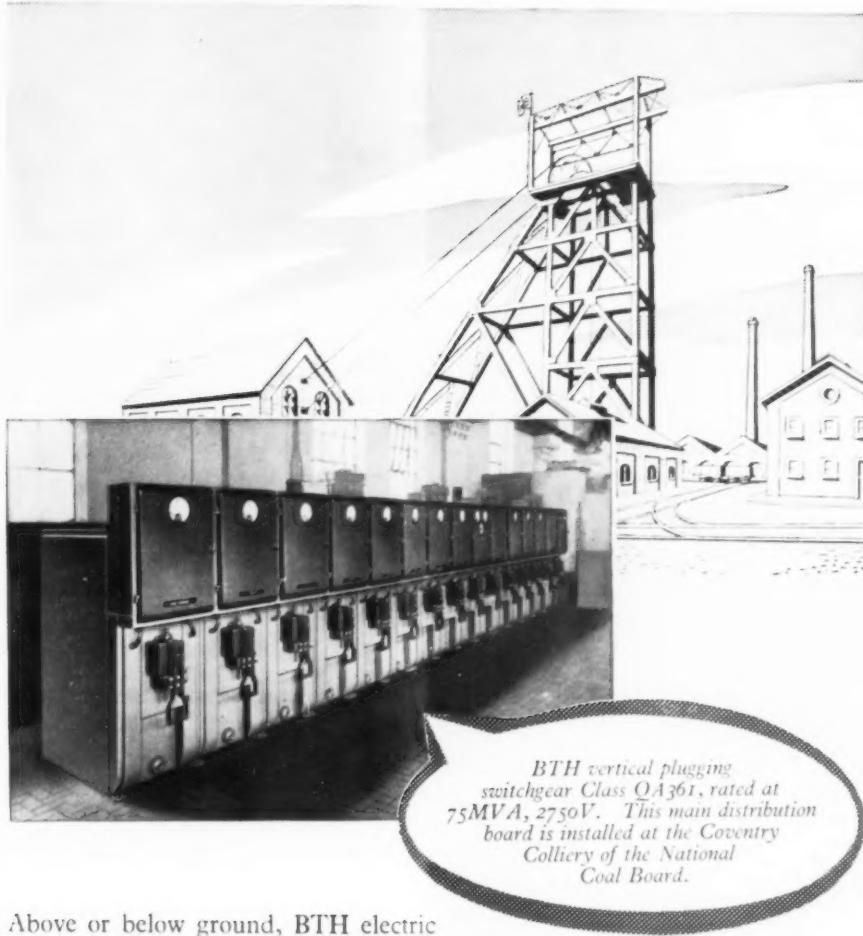
MANUFACTURED BY

**BBA**

BRITISH BELTING & ASBESTOS LIMITED • CLECKHEATON • YORKSHIRE



## ELECTRIC MINING EQUIPMENT *speeds production*



Above or below ground, BTH electric mining equipment—flameproof where required—provides power for the men employed in an essential industry.

## BRITISH THOMSON-HOUSTON

THE BRITISH THOMSON-HOUSTON COMPANY LIMITED • RUGBY • ENGLAND Member of the AEI group of companies

A4834

### Principal Overseas Representatives

**AUSTRALIA**, Sydney :  
Australian Electrical Industries Proprietary Ltd., G.P.O. Box 2517.

**MELBOURNE** : Australian Electrical Industries Proprietary Ltd., G.P.O. Box 538F.

**CHINA** :  
Hong Kong : Inniss & Ridgall (China) Ltd., 1st Floor David House, 67-69, Des Voeux Road Central.

**NEW ZEALAND**, Wellington : National Electrical & Engineering Co., Ltd., P.O. Box 1055.

**INDIA** : Associated Electrical Industries (India) Ltd., Calcutta P.O. Box 271, Bombay P.O. Box 484.

**PAKISTAN** : Associated Electrical Industries (Pakistan) Ltd., Karachi P.O. Box 4958, Lahore P.O. Box 146.

**SOUTH AFRICA**, Johannesburg : The British Thomson Houston Co., (South Africa) (Pty), Ltd., P.O. Box 482, Cape Town : Wilson & Herd Engineering (Pty), Ltd., P.O. Box 1459.

**WEST AFRICA**, Takoradi, Gold Coast, Colony : The West African Engineering Co., P.O. Box 100.

**RHODESIA**, Bulawayo : Johnson & Fletcher, Ltd., P.O. Box 224.

**KEVYA COLONY**, A. Baumann & Co., Ltd., P.O. Box 538 Nairobi, P.O. Box 323 Mombasa.

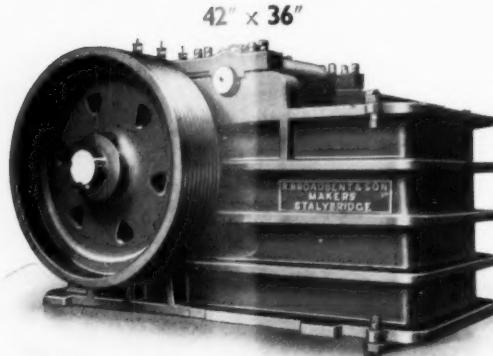
**TANGANYIKA**, A. Baumann & Co., Ltd., P.O. Box 277 Dar-es-Salaam.

**UGANDA**, A. Baumann & Co., Ltd., P.O. Box 335 Kampala.

*and others throughout the world*

# THE BROADBENT PRIMARY CRUSHER

MAKERS OF  
SCREENING  
ELEVATING  
AND  
LOADING PLANTS  
CHIPPING  
BREAKERS



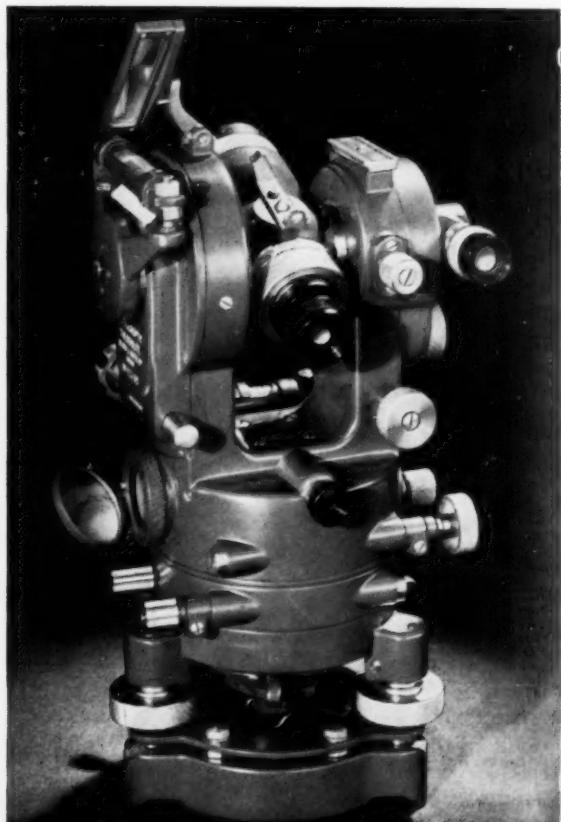
MAKERS OF  
PATENT IMPROVED  
BLAKE  
STONEBREAKERS  
GRANULATORS  
CRUSHING ROLLS

The firm with over 100 years experience  
ESTABLISHED 1837

**ROBERT BROADBENT & SON LTD.**  
PHOENIX IRON WORKS  
STALYBRIDGE

Telegraphic Address :  
BROADBENT, STALYBRIDGE

Telephone :  
STALYBRIDGE 2201



*For use below  
or above ground*

WATTS MICROPTIC No. 1 MINING THEODOLITE

A robust optical scale instrument reading directly to 20 seconds or, by estimation, to 5 seconds. All circle and micrometer readings taken from one transiting eyepiece. Built-in optical plummet.

Construction light and compact. Hardened steel centres and other mechanical and optical parts enclosed and fully protected. Wear adjustments to moving parts. Shockproof metal carrying case provided, fixed or sliding-leg Tripods.

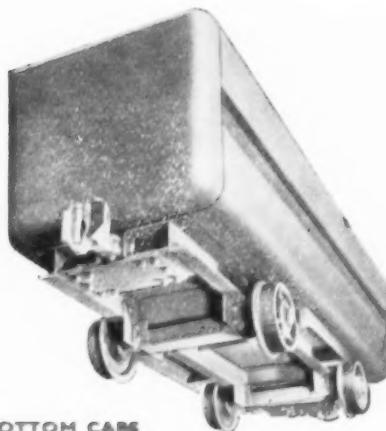
Complete 3-Tripod Traverse Outfit available, with targets, optical plumbets and theodolite on rapidly and accurately interchangeable bases. Plumbet views upwards and downwards.

*Please write for List MGJ/83 to*

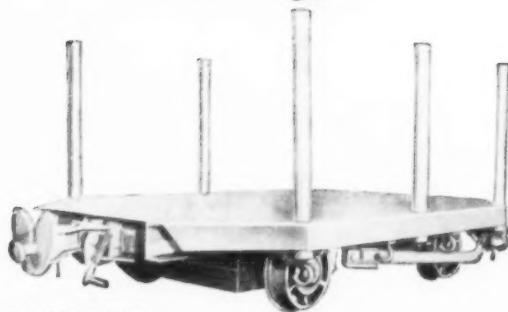
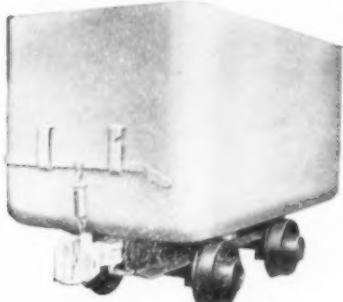
**HILGER & WATTS LTD**  
WATTS DIVISION

48 Addington Square, London, S.E.5

Member of the Export Marketing Company SCIEX

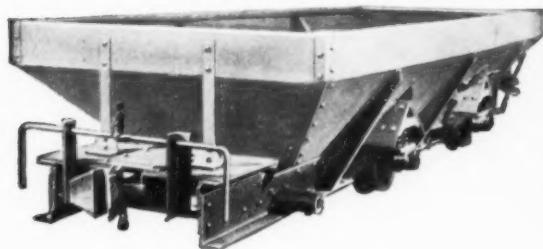


SOLID BOTTOM CARS



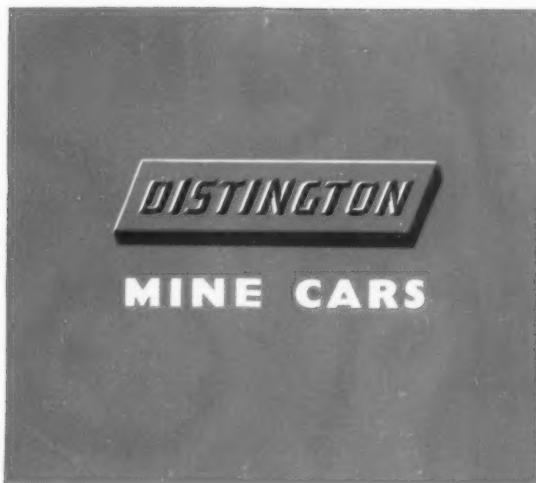
FLAT DECK CAR

DISTINGTON ENGINEERING COMPANY LIMITED • WORKINGTON • CUMBERLAND • ENGLAND



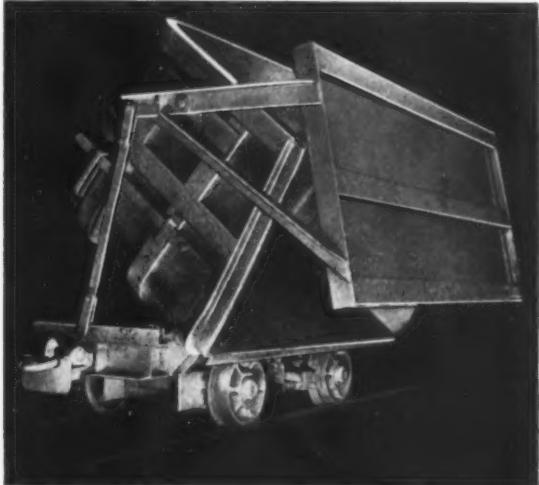
AUTOMATIC DROP-BOTTOM CAR

GRANBY TYPE CAR

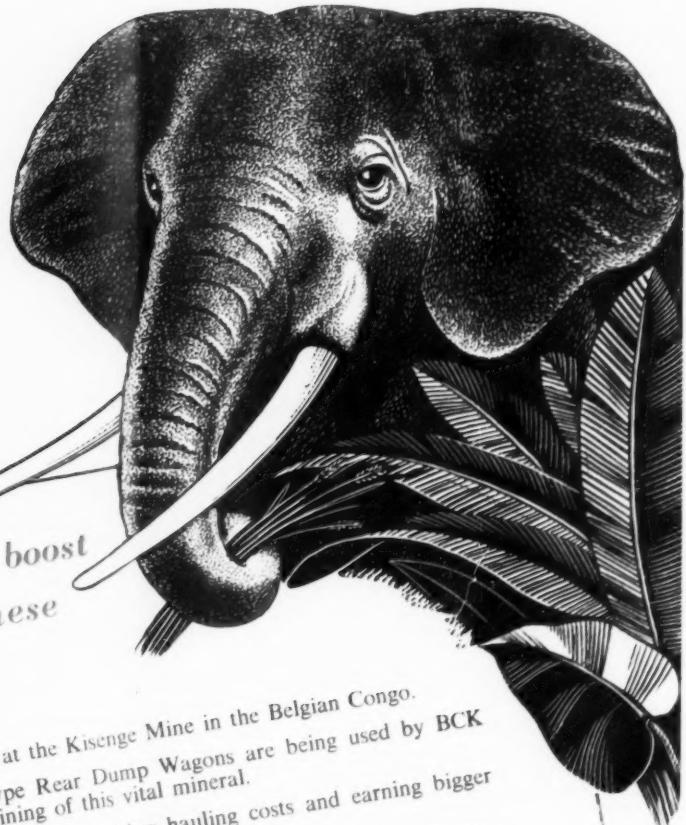


Most Distington cars are made by flow production methods which include the extensive use of jigs; their components are therefore interchangeable; re-assembly of the cars is straightforward after they have been exported in 'knocked down' form. Cars required in small quantities, are built individually.

Distington Engineering Company's staff responsible for the design of light railway vehicles, make the best compromises between the saving of weight on the one hand and stiffness, strength and low maintenance expenditure on the other. M.T.K. medium tensile, corrosion and abrasion-resisting steel is frequently used for making Distington mine car bodies. This steel offers a saving in weight or a gain in strength compared with ordinary mild steel.



SB 7A



Manganese ore is extracted at the Kisenge Mine in the Belgian Congo.

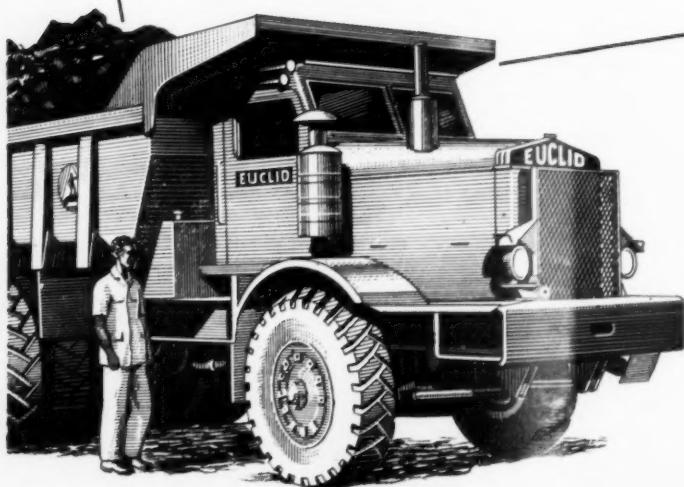
Sixteen EUCLID quarry-type Rear Dump Wagons are being used by BCK manganese to speed the mining of this vital mineral.

All over the world EUCLIDS are cutting hauling costs and earning bigger profits.

EUCLID earthmoving equipment is available for sterling. In the Belgian Congo, as in Great Britain and many territories overseas, EUCLIDS are distributed and serviced by

# BLACKWOOD HODGE

Subsidiary Companies Branches  
Works and Agencies throughout  
the World



# The Mining Journal

Established 1835

Vol. CCXLVI No. 6287

LONDON, FEBRUARY 17, 1956

PRICE 9d.

## CONTENTS

Notes and Comments	199	Machinery and Equipment	206
From Our Western United States Correspondent	200	Mining Miscellany	207
Geology of Uranium and Prospecting Methods	201	Metals, Minerals and Alloys	208
Developments in Scraper Chain Equipment	202	Company Shorts	210
The Nuclear Applications of Graphite	204	Mine Returns	212
Mineral Indications in Algoma Area	205		

Published by The Mining Journal Ltd., at 15 Wilson Street, Moorgate, London, E.C.2. MONarch 2567 Subscription £2 5s. per annum

## NOTES AND COMMENTS

### King Log or King Stork

Stockpiling was intended originally as a form of insurance cover to protect defence programmes from shortages of strategic materials which might arise from the disruption of sea communications in time of war. This aim still remains the basic objective of U.S. policy, but as the stockpiles grew it became increasingly evident that the immobilization of immense quantities of materials was having profound consequences on the mining industry and the metal markets of the free world.

The stockpile has become, as it were, an inanimate but voracious monster whose cavernous jaws swallow up ship-loads of scarce materials as effortlessly as a whirlpool sucks in straws. To the producer this new deity of the atomic era has the benevolent inertia of King Log in the fable. Its very existence has long been synonymous with high prices and assured demand. The industrialist, on the other hand, must be inclined to credit the stockpile with some of the more deplorable attributes of King Stork, it is everlastingly gobbling up materials which industry urgently needs, thus driving law-abiding fabricators into the arms of black market dealers.

The stockpile has also provided the U.S. Government with an effective means of encouraging domestic producers who would otherwise have no markets. For example, the U.S. tungsten mines cannot compete economically with imported tungsten ore and but for the government's purchase programme, extended by Congress in 1953, they would close down. Thus stockpiling has introduced yet another bone of contention into the political arena.

Latterly there have been indications that the stockpile was becoming less inexorable in its demands, due doubtless to the fact that its appetite for certain commodities was approaching saturation point. In the less fanciful words of President Eisenhower, quantities of copper, aluminium and nickel under contract for delivery to the government have recently been diverted to industrial use, and in the case of copper, some holdings outside the stockpile have been sold for essential uses. It was possible to do this without injury to the defence programme, because of the substantial progress that had previously been made in stockpile accumulations. Furthermore, the expansion

of capacity in some major industries, notably of aluminium, is correspondingly decreasing the need for stockpiles in the U.S.

In the fifth annual report of the Joint Committee on Defence Production it was revealed that the purchase of strategic materials during the past year under the Defence Production Act had used up "by far the greatest part" of the \$7.7 billion which had been expended under DPA since 1950. The total purchases of critical materials to date include the following amounts: aluminium \$1,441,000,000, copper \$857,000,000, nickel \$677,000,000, titanium \$518,000,000, tungsten \$374,000,000, tin \$224,000,000, molybdenum \$178,000,000, and magnesium \$129,000,000.

Seventy-five materials are currently on the list of strategic and critical materials being stockpiled by the government. Over-all objectives amount to \$10.4 billion, and of this amount approximately \$5.6 billion have been purchased and stockpiled. There are 46 materials for which the minimum stockpile objectives have been met. There are five additional materials for which the inventory on hand is more than 75 per cent of the minimum objective, and nine others for which it is more than half complete.

President Eisenhower's Budget message to Congress envisaged a more moderate rate of stockpiling this year, in line with the search for economies in Government expenditure. Net expenditure for the stockpile and for defence production expansion are expected to decline from \$713,000,000 in the fiscal year 1956 to \$378,000,000 in 1957. The President explained that this was the result of an increasing number of stockpile objectives being filled. He added that the high level of industrial activity had reduced the availability of some materials for stockpiling and required diversion of part of the new supply of a few materials to meet shortages in key industries.

There is nothing in President Eisenhower's message to suggest that a more moderate acquisition rate for the national stockpile need cause any apprehension to the mining industry as a whole, having regard to the high level of industrial demand which still prevails. According to the President the outlook for the fiscal years 1956 and 1957 is one of high economic activity. Despite the curtailment of production by motor car manufacturers, there are

many indications that economic expansion in the U.S. has yet to reach its peak.

It is believed that the U.K. Government has also decided to reduce substantially or to suspend altogether for the first quarter of this year its purchases of commodities for stockpiling. In view of the importance attached to commodity reserves, however, the liquidation of existing stocks would scarcely be contemplated, nor is there much likelihood that the major commodity markets would be affected by any reduction in the level of the Government's stockpile purchases.

Whether as King Log or King Stork, the stockpile is likely to remain an important factor in the metal markets during the years immediately ahead. From the fabricator's point of view, however, it is likely to become a kindlier deity as time goes on. Reduced stockpile purchasing is also in the long-term interests of producers, of minerals and metals, since it is undesirable that markets should be influenced unduly by requirements which, from their very nature, are essentially transitory.

#### Research into the Earth's Interior

The Department of Geology and Geophysics at the Massachusetts Institute of Technology and the Geophysical Laboratory of the Carnegie Institution of Washington has announced plans for a joint fellowship programme for research in theoretical and experimental geology. Its purpose will be to learn more about conditions in the interior of the earth.

This innovation in scientific work and education will be carried on by the award of pre-doctoral fellowships, which will be known as the Vannevar Bush Fellowships in Earth Sciences, in honour of Dr. Bush, former Dean and Vice-President of M.I.T. and, more recently, President of the Carnegie Institution of Washington, who retired in December. M.I.T. will provide training and guidance in theoretical interpretation, while the Carnegie Institution of Washington will make available its unique experience and facilities in experimental geology, besides contributing a generous part of the financial support required.

Candidates for the new pre-doctoral fellowships must have advanced training in mathematics, physics and chemistry, and a broad knowledge of the earth sciences. They must have completed all M.I.T. requirements for the degree of doctor of philosophy except the thesis, and will be registered as full-time doctoral candidates at M.I.T. The programme will offer unusually valuable opportunities for thesis work on challenging new problems. Fellowships will be awarded for the period required by the recipient to complete his laboratory work at the Geophysical Laboratory of the Carnegie Institution of Washington and the subsequent time required at M.I.T. for analysing and correlating the data and completing a dissertation. It is expected that under this joint programme the Fellows will spend at least three or four academic terms in Washington and one or two terms at M.I.T.

While the work envisaged in the programme may have immediate and ultimate applications, the primary emphasis will be on fundamental aspects of the field. One objective will be to teach young scientists to formulate a method of approach and then carry out laboratory experiments. Despite its fundamental character, however, the research is expected to be of great importance to geologists, geophysicists and metallurgists. It should lead to a better understanding of the causes of earthquakes, conditions in the earth's interior, and possibly the location of deep mineral and oil deposits whose existence is still unsuspected.

## Western United States

(From Our Own Correspondent)

Portland, Oregon, February 6.

In an effort to work out a definite minerals policy for the country, Secretary of the Interior McKay has set up 14 committees to work with the Office of Minerals Mobilization, which is in Mr. McKay's department. Each committee will deal with a separate branch of the industry and is made up of members especially qualified in the particular product involved.

As there are still some areas in the U.S. in which there is sufficient unemployment to cause concern, the Department of the Interior has announced that it would make contracts with foreign firms only when they underbid American firms in such areas of labour surplus by at least 12 per cent. It is expected that the Department of Defense and the General Services Administration will follow Interior's lead in this policy, in the face of a recent report by a Congressional sub-committee on foreign trade recommending repeal of the "Buy American" act.

#### UPS AND DOWNS IN COPPER

As if the copper industry had not had a surfeit of strikes during the past two years, workers at the Phelps-Dodge refinery at Laurel Hill, N.Y. called a wildcat strike on January 9 which is still in effect at time of writing. Loss of production, estimated at 12,000 tons of refined copper to date, comes at a time when prospects for relief in the already tight situation appear dim. (See page 208.)

Kennecott Copper Corporation has purchased from Combined Metals Reduction Co. the latter's Butterfield Mines at Bingham, Utah where Kennecott's Utah Copper division is situated. The Butterfield holdings have an area of 3,800 acres and have been a substantial lead-zinc producer. In 1955 Utah Copper division mined and milled 27,800,000 tons of ore, yielding 468,200,000 lb. of copper and 24,987,000 lb. of molybdenite, an average of 16.9 and 0.9 lb. per ton respectively.

Inspiration Consolidated (Anaconda) is enlarging and modernizing its concentrator at Globe, Arizona, to improve extraction and increase daily capacity to 16,000 tons. The programme involves an expenditure of \$5,000,000.

Reeves MacDonald, in British Columbia, just over the international border from its parent property, Pend Oreille Mines and Metals, has resumed production of lead-zinc ore at a rate of 900 to 1,000 tons per day, the first since 1953 when the mine was closed down on account of market conditions. Bunker Hill and Sullivan in Idaho is enlarging its electrolytic zinc plant to produce 7,200 tons of slab zinc per month, thus increasing its present capacity by 50 per cent.

#### EXPANSION IN THE LIGHT METALS

Kaiser Aluminum and Chemical Corporation has announced construction of a 500,000 ton alumina plant at Gramercy, Louisiana, and a 220,000 ton reduction plant at Ravenswood, West Virginia, which will bring the total capacity for this company to 654,000 tons of metal annually, an increase of 50 per cent over present capacity, and will make Kaiser second only to Alcos in output. The decision to build the new plants is based on a survey which indicates that demand for aluminum will reach 4,000,000 tons by 1965.

The largest industrial order in the industry's history was given Reynolds Metals by Ford Motor Co. by which Reynolds agrees to furnish Ford 320,000 tons of aluminium during the next ten years.

# Geology of Uranium and Prospecting Methods

Uranium is found in a great variety of minerals, it being possible to list nearly 100 species as uranium minerals proper and more than 200 species as minerals wherein uranium occurs commonly but not as an essential constituent. The following article is condensed from Geological Survey Bulletin 1030-A, *Search for Uranium in the United States*, a paper prepared as part of a programme of Raw Materials of the U.S. Atomic Energy Commission. The article describes the geological occurrence of uranium and continues to present a brief summary of the current methods used in prospecting activities.

Uranium is a chemically active and mobile metal. In magmatic processes some of it combines with other elements and crystallizes mainly as accessory minerals, particularly in late-stage differentiates such as silicic and silica-alkalic igneous rocks and pegmatites. Some, however, is concentrated with other metals in late-stage solutions and is transported from the magma by hydrothermal solutions and deposited, generally as pitchblende, in veins and possibly in pervious or carbonaceous sedimentary formations.

During the weathering of these primary concentrations, insoluble minerals, mainly the accessory minerals of igneous rocks and pegmatites, are freed from their matrix and some of them may eventually be concentrated in placers. However, most of the primary uranium is oxidized, taken into solution in the form of sulphates, carbonates, and other relatively soluble salts, and ultimately transported to the sea, either in solution or absorbed on clay and organic matter.

## DISPOSITION OF URANIUM

The dispersal of primary concentrations may be interrupted by the formation of secondary concentrations along fractures and in cavities in almost any kind of rock where uranium salts are precipitated because of evaporation, or changes in the pH or redox potential of the ground-water solution. Uranium may also be absorbed by carbonaceous materials—peat, certain coals, carbonaceous shale and plant fossils—or by phosphatic materials such as bone, phosphorite, or monazite.

It has been reasoned that the bulk of the uranium brought to the sea in solution is deposited on the shelves, probably because it is removed by organisms. Carbonaceous matter is associated with many types of uranium deposits, even with some of the vein and pegmatite deposits, as well as with many asphalites, isolated carbonized fossil plants, sandstone deposits, and many petroleums. In addition, radioactive decay products of uranium are found in many natural gases and oilfield brines. The significance of this association is not completely known. It seems definite that, amongst other factors, some carbonaceous matter is in some way a precipitator of uranium and that some plants concentrate uranium, at least in small amounts.

The progressive migration of uranium from its primary concentrations to sedimentary rocks involves a progressive dispersal of uranium from each phase of the cycle to the next. This is reflected in a change, roughly by a factor of five, in the maximum grade of uranium of deposits formed during each phase.

The relationships described in the uranium cycle have a special bearing on prospecting for they constitute the geologic machinery that produces a metallogenic province.

## METHODS OF PROSPECTING

The methods used to search for uranium deposits are geological, geophysical, botanical, geochemical and physical exploration.

Geological prospecting is based on the recognition of uranium minerals or on the recognition of geologic features commonly associated with uranium deposits. In geo-

physical prospecting, the radioactivity of uranium minerals may be detected by use of Geiger and scintillation counters.

Complications arise from the fact that most of the radioactivity detected comes not directly from uranium itself but from its radioactive decay products. These decay products, such as radon and radium, sometimes are separated from the parent uranium but even then they may reveal the presence of uranium nearby. In addition, the level of radiation in an ore-bearing zone in some areas is much higher in the general vicinity of ore than elsewhere. Similarly, the air in some mines is radioactive even though no radioactive minerals are observable in the mine walls, and some natural gases and brines are radioactive even though no uranium or thorium deposits are known in the reservoir rocks.

Two methods of botanical prospecting have been developed recently to the point where they can be used in the search for some uranium deposits. One method is based on the fact that certain plants, take up uranium from the soil if any appreciable amounts are present. Samples collected from these uranium absorbers in the vicinity of near-surface ore deposits contain two or three parts per million or more of uranium.

The other principal method is based upon the fact that certain plants require for their growth large amounts of selenium, others require large amounts of sulphur, and others require plant nutrients that are not released from the soil except where large amounts of acids are present, as is the case in the vicinity of sulphide orebodies. These plants are therefore indicators of selenium, sulphur, or other substances, and inasmuch as these substances are commonly associated with uranium, they may indicate also the presence of uranium. Botanical prospecting can be used only where the ore lies at depths of less than about 50 ft. and, furthermore, the indicator plant method can be used only where the indicated elements are known to be associated with uranium in the ore.

## USE OF GEOCHEMISTRY

Geochemical prospecting techniques, in which the metal content of soil or runoff is analyzed as a possible clue to the presence of concealed orebodies, are now widely used in the search for many other metals, but, as yet, they have not been much used in the search for uranium deposits, mainly because suitable field tests for trace amounts of uranium have not been available.

If any of these methods or a combination of them does point to a local concentration of uranium, the lead is followed by physical exploration—that is, drilling, trenching, test-pitting, or driving underground workings.

The selection of areas in which to use these methods deserves some comment. Two approaches may be distinguished. The observational approach has already been responsible for the discovery of uraniferous areas. The analytical approach has yielded important results in the search for uranium, mostly by the application of simple empirical relationships—the reasoning that if one phosphate rock is found to contain uranium, other similar phosphate rocks may contain it also.

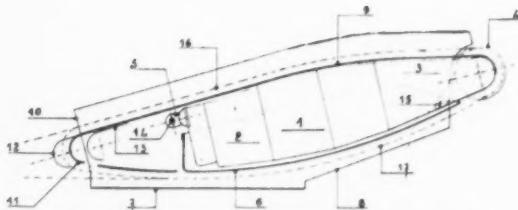
# Developments in Scraper Chain Equipment

Interesting developments have taken place recently in the technical aspects of scraper chain equipment, particularly in relation to the driving heads of conveyor belts used in connection with scraper chains. The trend of such work has been towards the construction of equipment for mines that will satisfy and comply with the technical requirements of aviation and motoring. The following article, condensed from *Revue de l'Industrie Minerale*, describes the current developments that have come about as the result of investigations concluded in France.

Recent investigations concluded in France have resulted in the development of scraper chain equipment possessed of considerably less bulk and weight, with increased service life and with economies in maintenance charges. In the development of such work, efforts have been made to avoid as far as possible all unnecessary movements having due regard to the preservation of mechanical and electrical security. In order to attain the desired results, many original devices have been employed, and such devices have been covered by patent rights in France and abroad.

## THE DRIVING HEAD

In the illustration a diagrammatic view is given of the lay-out of the driving head and its supporting base and frame. The driving head consists of one complete unit (2), (3) while (4), consists of the control motor, which is in the terminal transmission. This latter motivates the gears and



terminal surfaces are displaced at an angle which measures the utilization couple. There is a mechanism which controls the left and right travel. When the utilization couple reaches a maximum value for which the equipment has been built, a weigher device disengages the notch of a sliding bar (47), which holds the piston in such a position that the valve of admission (25) remains open. The piston (23) is subsequently set in motion through the fluid in the pipes (31) and by the distributor (15). This results in the hydraulic pressure becoming void, and hence the base wheel loosening, the transmission stops.

The advantages which accrue from use of the unit may be summarized as follows; the starting of the onload can be carried out with a progression law, when the load exceeds the limit chosen, the transmission of stress ceases instantly, if the motor power stops at any time, a safety device comes into operation, the initial onload may be motor driven, the synchronized speed passing to that of utilization. The time of transmission liberation when the load has reached the limit of its value is of extremely short duration.

## CHAIN DISCHARGE TENSION

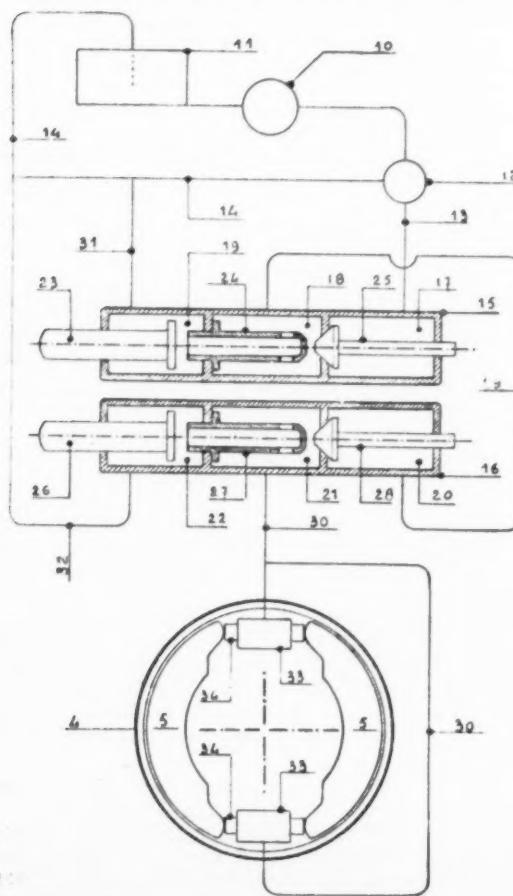
To the driving head designed, there is also attached a constant discharge of tension of the chains, operating either by means of a crank or angle discharge (40). In operation, the strings are stretched, bringing about a retreat towards the back of the independent pulleys which support the chains (1) and (2). When the cranks are turned anti-clockwise the springs are not engaged by the cables (19)

and (20). This action pushes the shell pistons (5) and (6) at a uniform speed until the moment when a gearwheel (3) brings the chain into tension.

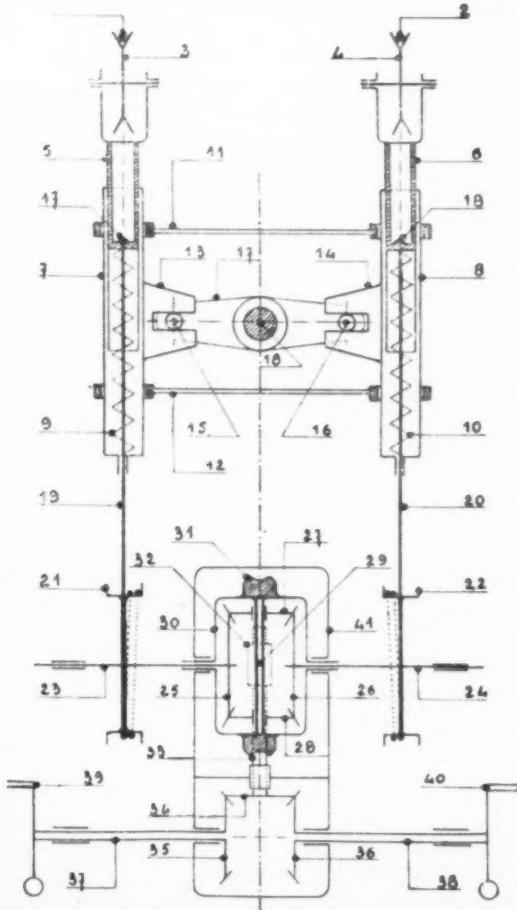
This tension reaches a predetermined value, which is of a low order, the tension is reduced in cable (19), the loss of balance caused by the differential gives to pulley (22) a double speed, and pulley (21) ceases to rotate. Cable (20) becomes unbalanced, and there is a restoration of balance of the couples on the differential. The result is that the wheels (4) will advance and wheel (3) cease movement. The cranks control the unrolling of the cables, ensuring that wheel (3) and (4) will simultaneously and at a given moment be in pressure on the chains. The latter wheels are now out of alignment and the chains are of unequal length, hence the machine will pivot round point (18), thus restoring the spring load, which is actually the equilibrium conditions of the differential demanded by the machine. The unrolling of cables (19) and (20), reduces the tension, the machine thus gaining its position of equilibrium, which in turn equates with the tension of the chains.

## **SURFACE WEARING**

If during surface work wearing becomes manifest, wheels (3) and (4) will continue to operate without a break of equilibrium conditions, thus providing equality of tension on the chains. In the case of a multi-motor control driving head, there is a patented differential arrangement whereby the motor loads are rendered equivalent. This latter arrangement prevents any slipping motion by the coupler.



### The transmission and hydraulic control mechanism



### Constant discharge of tension of the chains

## GRAPHITE—II

# The Nuclear Applications of Graphite

This is the second and concluding instalment of an article surveying the production and utilization of graphite. Some applications of graphite in nuclear reactors are here described, the examples given being drawn from *Peaceful Uses of Atomic Energy*, Vol. 3, Power Reactors (H.S.O., Price 54s.).

Graphite is of special interest as a reactor moderator, since it combines good nuclear properties with other advantages of nuclear control, instrumentation, and piping geometry. In addition, there is a relatively complete material technology available in the industry, as well as extensive operating experience in large-scale reactors in Britain and the U.S. In discussing the advantages of graphite, D. I. Blokhintsev and N. A. Nikolaev, U.S.S.R., refer to the established fact that graphite expands under the action of neutron irradiation due to crystal lattice distortion, the relative change of its dimensions depending on the integral dose of fast neutron irradiation. Operation of the graphite at high temperatures counteracts this phenomenon. The increase in the dimensions of graphite is very anisotropic, owing to the peculiarities of the mineral's crystal structure and texture. A second important phenomenon established for graphite is a decrease in the thermal conductivity of the material. This decrease is a function of the integral dose of irradiation and the temperature, and is also anisotropic. Wherever graphite is subjected to bombardment by fast neutrons, i.e., in the immediate vicinity of the uranium rods—its thermal conductivity may fall to a value several times smaller than its usual magnitude.

## DEVELOPMENTS IN EUROPE

The first industrial atomic power station in the U.S.S.R. has an output of 5,000 kW, and was completed in 1954. The reactor is enclosed in a hermetically sealed cylinder jacket mounted on a concrete foundation. The jacket is filled with graphite brickwork having sufficient clearance to compensate not only for the thermal expansion of the graphite, but also for its possible swelling under the action of the neutrons as well. A total of 128 fuel channels pierce the central part of the graphite brickwork. Each fuel channel is a long graphite cylinder containing thin-walled steel tubes carrying the primary circuit cooling water. The water enters through the upper end of the channel which is connected with the inlet and outlet headers, then runs down through the tubes and returns, flowing up over the surface of the uranium fuel elements. The latter form the cylindrical active zone of the reactor, 150 cm. in dia. and 170 cm. high, and are enclosed by a graphite reflector.

Since this atomic power station was started up on June 27, 1954, it has been tested in various operating conditions. In view of the changes that graphite undergoes in a neutron field, it might have been feared that the holes in the graphite brickwork would become clogged with fuel elements. Experience in channel replacement, however, shows that the fuel channels are easily removable. The temperature of the graphite proved to be above the rated value and at the hottest points reached 1,200-1,400 deg. F.

The five-year plan carried out under the authority of the French Atomic Energy Commission since 1952 includes, among other objectives, the construction of the first two French graphite moderated reactors at Marcoule near Avignon. G1 was scheduled to start up at the beginning of 1956 and reach full power later in the same year. This reactor, which is designed to produce plutonium, was described to the Conference by P. Chambadal and M. Pascal. It will use natural uranium as a fuel, graphite as a moderator, and air under a pressure close to that of the atmosphere as a coolant. The total thermal power expected

from the reactor is approximately 40 mW. for a load of 100 tons of magnesium clad natural uranium made up of rods 3.80 m. long. The uranium is made up into slugs of 26 mm. dia., 100 mm. long; the cladding metal is provided with eight fins and its outer dia. is 62 mm., the channels in the graphite having a dia. of 70 mm.

The graphite pile is in the general form of a cylinder 8.840 m. long and 9.600 m. in dia. It is pierced in the central section by an 80 mm. slit and is perforated by 1,337 horizontal channels for each half of the pile, which will receive the uranium.

The second French graphite reactor, G2—described to the Conference by P. P. Gilleret, P. Taranger and J. Yvon—was expected to be in operation by August, 1957. It uses natural uranium as a fuel, graphite as a moderator, and compressed carbon dioxide as a coolant. The fuel (100 tons of uranium) is again used in the form of cylindrical slugs clad in a finned magnesium sheath. The slugs rest in horizontal channels of 70 mm. dia., which are provided in the graphite for the purpose. The graphite in which the channels are cut has a specific gravity of 1.7 and a 4 mb. capture cross-section (for 2,200 m./sec. neutrons). It comes in square cross-section blocks. The side of each square (200 mm.) is exactly equal to the dimension of the lattice. These blocks are piled up to form a right prism, the bisector plane of which is vertical. The active core is 8.45 m. high and of 7.80 m. dia., these dimensions corresponding to 1,200 channels.

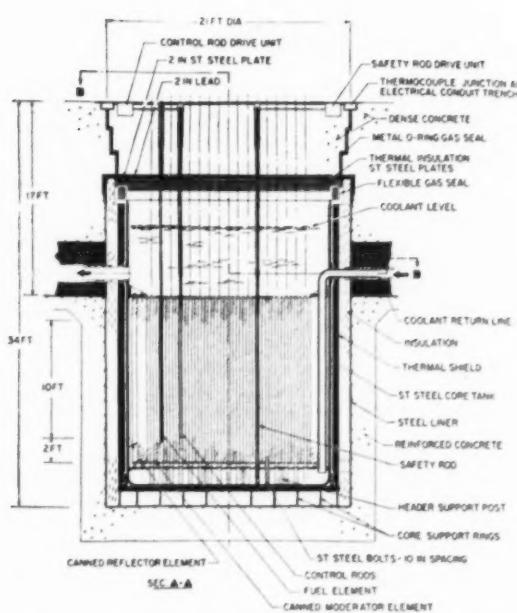
Fuel is renewed without any need for a shut down, the warm slugs being automatically replaced and falling by gravity down chutes inclined at 45 deg. This slope is the factor which determines the manner in which the graphite blocks are piled up.

## NUCLEAR ELECTRICITY IN THE U.S.

Another graphite moderated nuclear plant was described by R. K. Anderson, A. B. Carson and J. E. Love, U.S.A., of the Reactor Design and Development Unit, Engineering Department, Hanford Atomic Products Operation, G.E.C. With the anticipated successful development of long-exposure fuel element designs, this plant is capable of producing electrical power at an economically competitive level in many parts of the world. The design is for a heterogeneous, graphite moderated high pressure water-cooled reactor of 800 mW. thermal rating, combined with a power generation system capable of producing 223,000 kW. of net electric power.

The moderator consists of a rectangular stack of graphite blocks 18.4 ft. wide, 18.7 ft. high, and 24 ft. long, and is pierced by 1,521 zirconium alloy process tubes. Facilities are provided for maintaining a controlled inert gas atmosphere for the graphite moderator by the introduction of helium between the graphite stack and the thermal shield at the inlet face of the reactor.

One of the promising approaches to economical nuclear power is the liquid metal cooled, high temperature, non-pressurized reactor type. A present embodiment of this concept is the sodium graphite reactor (SGR) system. The design of a sodium graphite reactor for a proposed 75,000 electrical kW. power plant was discussed by Chauncey Starr, U.S. A liquid metal such as sodium offers many



**Sodium graphite reactor plant described by C. Starr, United States**

advantages as a heat transfer fluid. While solid at room temperature, it melts at 208 deg. F. and is therefore easy to keep liquid in power plant systems. Sodium boils at 1,620 deg. F. and thus permits adequately high coolant temperatures with the system at atmospheric pressure. Because liquid metals, sodium in particular, have extremely high thermal conductivity, they are excellent heat transfer media. The fluid dynamics of liquid sodium is similar to that of water. A further advantage of sodium is the general absence of chemical corrosion in metal systems. Because of these characteristics, the engineering development of the sodium graphite reactor and its heat extraction system may eventually permit the production of steam temperatures which will be limited only by turbine performance, and also the simplification of the reactor cooling system to an extent approaching low pressure water systems.

#### ADVANTAGES AND DISADVANTAGES

The choice of graphite as a moderator results from the fact that this material is mechanically easy to handle, as compared to any liquid hydrogenous moderator, and is considerably less costly than beryllium, which might also be used. The principal disadvantage of graphite is associated with its porosity, which causes it to act as a sponge when in contact with liquid sodium. For this reason the graphite is contained in zirconium metal cans.

In mid-1954 North American Aviation Inc. entered into a programme with the U.S. Atomic Energy Commission aimed at expanding the known area of information on the sodium graphite reactor. The sodium cooled graphite moderated reactor will be experimentally demonstrated through the construction and operation of a 20,000 thermal kW. pilot reactor incorporating the major design features of a full-scale sodium graphite reactor.

The design provides for 233 moderator elements forming an active core 13.3 ft. in dia. by 10 ft. high. A 2 ft. reflector surrounds the core in both radial and axial directions resulting in overall dimensions of 17.3 ft. dia. by 14 ft. high. The moderator elements are graphite columns contained within sealed zirconium cans having 0.035 in. wall

thickness. There are small gaps between the zirconium and graphite to allow for thermal expansion and clearance for assembly. A nominal clearance of 0.100 in. is provided between adjacent can walls to permit sodium coolant to flow between these elements.

#### FEASIBLE APPLICATIONS OF GRAPHITE

Because of its relatively low cost, as well as its ability to withstand high temperatures, graphite was chosen as the moderator for a liquid fuel reactor described by F. T. Miles and Clarke Williams, U.S.A. Since it has a low neutron capture cross-section and retains its strength at high temperatures in the reactor, it is also used as the material for the interior structure of the reactor. No reaction between graphite and the uranium-bismuth fuel has been observed at temperatures up to 1,000 deg. C. with exposures of 100 hours. At higher temperatures up to 1,200 deg. C. there is some reaction. However, in the presence of a few hundred parts per million of Zr there is a preferential formation of ZrC and no evidence of UC is found. On all counts the operation of the reactor with the U-Bi fuel in direct contact with the graphite is quite feasible.

This reactor uses very small quantities of metallic absorber materials for structural purposes in the core and blanket, resulting in a high neutron economy. The reactor core is pure graphite; the barrel-shaped vessel separating the core fluid from the blanket fluid is, with the exception of the alloy bonding rings, pure graphite. End connections from the graphite inner vessel to the outer containment vessel are made by means of transition pieces which make a connection between the alloy clamping ring attached to the graphite and the outer containment vessel.

Since a moderator is required in the blanket, graphite rods 3.2 in. in dia. are placed in the blanket volume outside the graphite vessel. Fuel is pumped directly through the inner vessel and core from bottom to top. The thorium-bismuth slurry is pumped through the blanket, flowing upward around the rods and out at the top. The entire graphite core and blanket assembly is contained in a steel pressure vessel 12 ft. in dia. and 15 ft. high, which is constructed of a relatively inexpensive low chrome steel.

#### Mineral Indications in Algoma Area

It has been announced that an aerial magnetic and electromagnetic survey carried out by Aeromagnetic Surveys Ltd. over 36 sq. miles of Township 25, Range 25, in the Sault Ste. Marie Mining Division, Ontario, last autumn, revealed extensive magnetic and electric conductor anomalies. This work was arranged by Hopkins Exploration and Associates, and several hundred claims have been staked in the township already.

A Syndicate, headed by Frobisher Ltd., has obtained about 180 claims and Boyles Bros. is presently building a road to the property. Boyles has a 3,000 ft. diamond drilling contract. Alator and Brian Newkirk have also acquired property in the township. Hopkins Exploration have acquired a 100 claim group, in which eight interesting aerial electric anomalies occur, and the five investigated to date on the ground just before freeze-up are represented by gossan, rusty carbonates, and sulphides with widths exposed up to 60 ft. Copper and zinc sulphides were noted together with pyrrhotite and pyrite. A minimum of 4,000 ft. of diamond drilling has been recommended. Plugs of gabbro and porphyry were noted in the carbonatized faulted lavas.

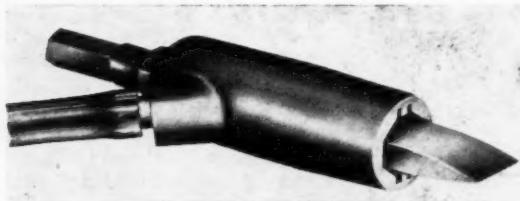
Staking is continuing apace along what is believed to be a faulted extension of the Hamilton Iron Range.

## MACHINERY AND EQUIPMENT

### A Dust Controlling Sleeve

A new type of dust controlling sleeve easily fitted for pneumatic chipping hammers has been specially developed for foundry requirements by the Dustuctor Company Ltd. It is based, like other Dustuctor equipment, on the low volume high velocity system of dust-collection at source which was pioneered by this company.

In fettling operations, respirable dust which is most dangerous in the invisible size range of .55 microns, is injurious to the health of foundrymen. The Dustuctor chisel-sleeve controls and collects the dust created at the chisel edge when fettling or cleaning and descaling castings, or similar operations. It makes its appearance in a year when new foundry regulations under the Factory Acts make effective means of dust control in the foundry compulsory.



The Dustuctor chisel sleeve

The new sleeve is simple to fit and its shock absorbing characteristics assist the operator. It does not reduce efficiency, and the air consumption is small. Dust collection takes place at about an inch from the chisel point, the dust being drawn through slots on the inner surface of the sleeve, forming ducts with the surface of the chisel itself, from which dust is led to an integral branch at the top of the sleeve and thence to the collecting apparatus.

Positioning is by means of an annular ring ground in the chisel which coincides with a ring in the sleeve itself. As the chisel shortens during its life, the sleeve can be cut back, and is designed to be kept about 1 in. from the cutting edge.

A vacuum of 5 in. of mercury is required at which depression the sleeve passes 6.5 cu. ft. of air per minute. Light plastic hose of  $\frac{1}{2}$  in. i.d. is supplied with each sleeve. For lengths over 10 ft. larger hose is available.

### A Range of Electro-Magnetic Vibrating Equipment

The general principle common to the entire range of the Sherwen A.C. vibrating equipment manufactured by the Fraser and Chalmers Engineering Works of the General Electric Co., Ltd., is that pulsating current, obtained by means of a half-wave rectifier from an A.C. supply, enables the vibrator to be operated direct from the mains without the use of contact gear or special generators.

The Sherwen vibrator is, of course, well known, consisting of one or more former-wound coils with stationary, laminated cores mounted on the main frame. These coils are connected in series with the half-wave metal rectifier, and the moving armature is mounted on the live frame or deck. The vibration frequency is constant since it is fixed by the supply frequency.

Sherwen feeders can be supplied to handle materials ranging from powders to 4 ft. fragments, with capacities from a few oz. per hour to several hundreds of tons per hour. The vibrating feeders operate on the same principle as the Sherwen screens, except that small units are connected direct to the mains and not through a half-wave rectifier as on the medium and heavy duty units. Control of output is instantaneous throughout a wide range, a feature ensuring a continuous and even flow of material.

The Sherwen electro-magnetic vibrating screen is available in two types, one with the vibrator set at right angles to the screen mesh and the other, the screen conveyor, wherein the vibrator is set at an angle of some 45 deg. to the mesh. Both types can be supplied in single or double deck form and in sizes ranging

from 2½ sq. ft. to 40 sq. ft. The power consumption ranges from approximately  $\frac{1}{2}$  h.p. to 3 h.p.

These equipments are fully described in a brochure recently published by the manufacturers.

### Liquid Metal Pumps for Nuclear Power Plants

Mounting activity in the field of nuclear energy is giving rise to secondary developments in a number of directions. One of these concerns the pumping of a liquid metal used as a carrier for heat energy generated within the nuclear reactor. The liquid metal, which is both radio-active and hot, can be pumped either mechanically or electromagnetically, and it is not yet certain which method will finally prevail. However, it is already clear that the electromagnetic pump has considerable advantages because of its simpler liquid-circuit and absence of glands and of rotating parts.

In pumping electromagnetically, force is transmitted to the fluid by contriving that it passes through a magnetic field while carrying a current at right angles both to the field and to its direction of motion. There are two general methods of achieving this; in one, current is led from one outside conductor to another through the walls of a pipe and so through the liquid, and in the other the current is induced wholly within the liquid.

Pumps using the first method (conduction pumps) fall into two categories; in one the pump operates with direct current and a fixed magnetic field, and in the other with a simultaneously alternating magnetic field and current.

For nuclear power plants a considerable flow of cooling liquids is required and here the pump is likely to be of the poly-phase, travelling field induction type. An experimental pump of this sort developed and constructed in the British Thomson-Houston Research Laboratory is capable of carrying 400 g.p.m. against a pressure of 15 lb. sq. in.

### Caterpillar Tractors to be Manufactured in U.K.

Caterpillar Tractor Co., Ltd., of Great Britain recently announced a project to manufacture crawler tractors in the United Kingdom. Heretofore, the activities of this subsidiary of U.S. Caterpillar have been confined to the replacement parts business. For the new manufacturing project, a factory is to be built at Glasgow, Scotland. The first unit will house about 500,000 square feet of manufacturing space.



The Cat D 8 tractor working in conjunction with Birtley scraper

British Caterpillar will be given rights to make and sell all or any of the regular products of its U.S. parent and to use its trademarks, copyrights, specifications, manufacturing processes, and any other technical information.

The first machine to be produced in the new Glasgow factory will be the D8 Diesel crawler tractor. It will be followed by the D4 model. Other models will follow later and all U.K. machines will be exact counterparts of U.S. machines. All parts will be interchangeable without regard to source of origin.

It is estimated that about 75 per cent of the British output will be exported—much of it in direct competition with the American product.

## MINING MISCELLANY

A European Metal Founders' Federation has been formed with headquarters in Paris.

Talks have begun at New Delhi on the final British suggestion for the construction of a 1,000,000-ton steel plant in West Bengal, estimated to cost over £80,000,000.

Continued progress in the development of India's mineral resources is indicated by the annual report of the Chief Inspector of Mines in India for 1953.

A central British market for scrap metals is to be opened in Birmingham on May 28, covering nearly 50 different classifications of ferrous and non-ferrous metal scrap.

Negotiations are in progress for a barter deal under which Japan would supply Spain with 500 tons of primary aluminium, 3,000 tons of alumina and 2,000 tons of aluminium hydroxide in return for 50,000 tons of Spanish rice.

The preliminary draft of a four-year Development Budget for Israel envisages development of the Dead Sea potash works, copper mines and the construction of petroleum-chemicals plants.

The World Bank Mission which is to make a technical survey of the Zambezi hydroelectric scheme at Kariba Gorge will arrive in the Federation on February 20. The composition of the mission is not yet known.

President Eisenhower has called for a complete investigation of what happened in the Nicaro nickel case and said that he would take no action until he had all the facts. The Nicaro plant supplies metal to both industry and the national stockpile.

New income-tax concessions to help the economic development of Malaya are to be granted under a new Bill to be introduced in the Federal Legislative Council. Money spent on searching for mineral deposits will be deducted from taxable income if the search proves abortive.

Production of iron ore in Venezuela in 1955 is estimated to have been 8,220,000 metric tons, compared with 5,388,000 tons in 1954. Practically all was exported. In view of increasing requirements in the U.S., the U.K. and Germany, still higher production is expected in 1956.

The Fresnillo company has purchased the Gibraltar mine at Naica Chihuahua, Mexico, which adjoins the lead-zinc-silver ore deposits now being worked through the firm's Naica lease. Capacity of the Naica mill will be increased in order to raise production by about 50 per cent. Average grade of the Naica-Gibraltar ore is stated to be higher than that obtained from the Fresnillo mine.

The discovery by Rio Canadian Exploration of a large sulphide mass enriched by copper mineralization in the Clercy township, about 10 miles north-east of Noranda, has led to a rush reported to be greater than the gold boom in that area in 1943-45. Over 5,000 mining claims have been staked in the vicinity of Rouyn Noranda within ten weeks.

In a brief before the Royal Commission on Canada's Economic Prospects, Mr. V. C. Wansborough, vice-president and managing director of the Canadian Metal Mining Association, asked for the continuance of federal subsidies under the Emergency Gold Mining Assistance Act. Otherwise "there will be ghost towns throughout the gold mining areas," warned the C.M.M.A.

The Annual Report of the Government Mining Engineer and Chief Inspector of Mines, Southern Rhodesia, recalls that the forecast of the Rhodesian gold output for 1954 proved too pessimistic; production increased by 34,795 oz. instead of by 2,000 oz. as predicted. More than half the increase came from higher outputs at the Cam and Motor and Dalny Mines, whose production is expected to remain at the same general average for some time.

An aerial survey official has said that Canada's mining geo-physical industry, now worth \$6,000,000 a year, will probably double in the next two years. Mr. Douglas Kendall, vice-president of Aeromagnetic Surveys Ltd., made this prediction in a brief prepared for presentation to the Royal Commission on Canada's Economic Development. He stated that the chief

reason for the expansion would be Canada's technological advances, particularly in airborne electromagnetic equipment.

The Annual report of the Tin Research Institute for 1955 deals fully with the progress of research work on hot-tinning, tinplate, soldering, electrodeposition, metallurgy and organotin compounds. An improved method of tinning cast iron, known as the "direct chloride" method, was developed during the year. Tinplate researches were successful in producing a new test for assessing the ability of tinplate to resist rusting due to the atmosphere.

Geological and surveying work was started last year in many localities of the Iliza district, Kielce Voivodship, south-east Poland, where there are large deposits of ferriferous sand. This work has provided the basis for the construction of the first completely mechanized open-cast mine for ferriferous sand in Poland. Construction will be started next year. At the same time, plant for the enrichment of low-grade ore by methods elaborated jointly by Polish and Russian scientists will be started. These methods are on similar lines to current work in the U.S. on the extraction of iron from taconite.

Mr. Thayer Lindsey, board chairman of Ventures Ltd., predicts that for a generation or more Canada will be the Mecca to which all the world will turn for an enormous and increasing amount of raw materials. To encourage production expansion Canada must foster those conditions and principles that make possible the growth of the mineral industries. To expand the economy, Canada must also encourage processing of materials at home, and finally "we must have the vision to conquer the barriers of the north and create new enterprises wherever minerals may be found."

Mr. R. E. Stavert, president of Consolidated Mining and Smelting, warned the Royal Commission on Canada's Economic Development that a production control policy might turn consumers to other metals. He conceded, however, that an exception might be made in the case of a highly strategic mineral which was scarce in Canada but plentiful elsewhere. He also pointed out that "a policy of holding back development of non-renewable resources, particularly metals, requires among other things a large measure of governmental control, the administration of which might prove to be very difficult and costly."

## Obituary

### WILLIAM JOHN FELTON

It is with deep regret that we record the death of Mr. William John Felton, suddenly at his home on February 10, at the age of 52.

Mr. Felton commenced his career in 1919 as a clerk on the administrative staff of the University of London then at South Kensington. By dint of evening study at Birkbeck College, London, he obtained the degree of B.Sc. (Econ.) at London University. In 1925 he was appointed to the Geological Survey Department of the Gold Coast as Personal Assistant to the Director, the late Sir Albert Kitson, a position in which he distinguished himself in many ways.

In February, 1932, he resigned from the Geological Service to become Assistant Secretary and Librarian of the I.M.M., succeeding, in 1939, the late Mr. Charles McDermid as secretary and editor of the Institution. During the war Mr. Felton served as a major in the Home Guard.

Throughout his career Mr. Felton proved to be a man of many splendid attributes. In addition to possessing a remarkably equable temper and keen sense of humour he had an enormous capacity for sustained hard work. Whatever task he undertook he accomplished quickly and with a thoroughness which was the admiration of all who had the good fortune to work with him. Many fine achievements were his, and all who knew him will regard his passing, in the prime of life, as a grievous loss. Many will miss his helping hand; he will not easily be replaced. The courage and fortitude which he showed during many months of intense suffering heightened the esteem in which he had always been held. He will long be remembered as an outstanding personality of numerous sterling qualities.

Our sympathies are extended to his widow and family of three grown up children.

## METALS, MINERALS AND ALLOYS

**COPPER.**—The spread in the domestic U.S. copper price remains unchanged at 43 c. quoted by domestic producers up to 52 c. required by customs smelters for prompt metal, although the latter are reported as offering June metal at 47 c. No. 2 copper scrap was being quoted early this week at 41 to 41½ c.

Last Friday saw the settlement of the five-week strike at Phelps Dodge's Laurel Hill refinery. The stoppage represents a loss on current refinery production of about 15,000 tons. Unlike lost mine production, which can only be made good gradually—if at all, lost refinery production is in effect only a deferment of production and every effort is now being made to step up output to recover lost ground.

On the London market the surprising development has been the reduction in the backwardation to about £17. There would appear to be no change in the long term outlook to justify this; indeed, the settlement of the strike at Laurel Hill might reasonably have been expected to have had a contrary influence. It is thought in the market that the most likely explanation is that some stockholders both here and on the Continent have been able to take advantage of an improved stock position to sell prompt and buy forward in anticipation of a falling market.

The value of Rhodesia's copper production in 1955 is reported to have reached the record total of £110,000,000—an increase of £20,000,000 over 1954 despite the African Mineworkers' strike earlier in the year, which at the time was estimated to have cost the industry some 30,000 tons. At a rough estimate the copper companies are expected to have made a profit during the calendar year 1955 of some £66,000,000. Of this total, the Federal Government will collect about £20,000,000 in tax. This represents about half the total fiscal revenue for the whole of the Federation. The fact that the Northern Rhodesian territorial government receives only 17 per cent of this huge copper revenue is, of course, at the root of much of the dissatisfaction expressed in the Northern Territory regarding the benefits of Federation. It is no rare thing these days to hear the comment that if Northern Rhodesia were still an independent unit not only would the Kafue scheme be now well on the way but that it would be being paid for out of revenue! However, broader political and social issues than this are, of course, at stake and the best commentary on this viewpoint is to be found in the energetic manner in which both the leading Copperbelt groups are planning to assist the broader economic development of the Federation. Whatever history may record of the restrictive influence in years gone by of South Africa's gold mining industry on the development of a more broadly based economy, it is clear that the copper groups have no intention that any such criticism should ever be laid at their door.

The recent sharp increase in exports of copper wire from Britain to the U.S.S.R. are currently the subject of investigation by the U.S. Senate Permanent Investigating Sub-Committee. Exports during the first seven months of last year are said to have totalled about £2,500,000 compared with £3,000,000 during September and October.

Mine output of copper in the United States last year is reported to be 19 per cent up on 1954 with a total of 992,600 s.tons compared with 835,472 s.tons. Last year's output is the highest since the wartime peak of 1943. Arizona (452,000 s.tons and Utah 231,440 s.tons) together provided over 70 per cent of the total production.

**LEAD AND ZINC.**—Monday of this week saw a slight widening of the backwardation for lead although this preceded the news that the Australian dockworkers had voted to return to work. Although the strike has only lasted three weeks, there may well be a longer gap than this in shipments to this country, in view of the priority that will have to be given to ships carrying perishable goods.

In the case of zinc the ore position is, of course, more flexible, and the impact of the waterfront stoppage on the market is consequently less direct. Nevertheless, a stiffening of the backwardation is perceptible here too, although in this case it is probably attributable to Continental producers having been able to find alternative outlets for prompt G.O.B. metal to offset the easier tone of the London market.

In the case of lead, the probable cut back this year in housing both here and in the States, and in the case of zinc, the certainty of a sharp cut back in U.S. car production, are other factors which should in the short term tend to widen the backwardation still further.

Senator Frank Carlson (R. Kansas) has introduced a Bill into the Senate under which the U.S. Government would be

permitted over a five-year period to buy lead and zinc ores from marginal producers at a guaranteed floor price which would ensure adequate domestic supplies of lead and zinc "in times of national emergency". Other members of Congress from the Tin States are reported to be lukewarm in their support, in view of the present satisfactory price level.

The following is an estimate from the British Bureau of Non-Ferrous Metal Statistics of world slab zinc production in 1955. The figures cover primary and secondary metal and thus represent the total amount of marketable metal available to consumers.

Country	(000 I.tons)		
	1953	1954	1955
U.S.A.	865	775	920
Canada	221	194	230
Belgium	190	210	207
Germany	148	167	177
Japan	76	100	111
France	77	107	108
Australia	90	105	101
Iron Curtain (estd.)	323	377	385
Others	338	389	404
Total	2,328	2,424	2,643

The Bureau estimates that world production and consumption were approximately in balance for the year. This would imply an increase in consumption of about 300,000 tons over 1954. On this basis stockpile intake must have been extremely small.

**TIN.**—Production and consumption figures for 1955 can now be estimated with some accuracy on the basis of the latest monthly bulletin of the Tin Study Group. The following are the totals for the principle producing countries, together with an estimate of world production:

Country	1954	1955
Belgian Congo	15,084	15,208
Nigeria	7,927	7,990*
Bolivia	28,824	27,600*
Indonesia	35,861	33,368
Malaya	60,691	61,245
Thailand	9,776	10,950*
Estimated World Total (excl. China)	169,500	168,300*

\* December figures estimated.

On the consumption side the total last year seems likely to be about 149,000 tons (again excluding China) compared with a 138,600 in 1954. The gap between production and consumption is thus reduced to about 19,300 tons compared with 31,000 tons last year. Certainly the surplus to be taken up during the current year should be very considerably less than this amount, as stockpile purchases, which will continue until the middle of this year, have been running at about 2,000 tons per month, although this figure will presumably fall as the Texas smelter's rate of production tapers off.

A reasonable guess as to the offtake by the stockpile this year by the Texas smelter might, perhaps, be some 7,000 or 8,000 tons, leaving, on the basis of last year's excess production, no more than 12,000 tons to be absorbed this year under the I.T.A., which will presumably come into force some time in April. Certainly the running down of the Texas smelter should not begin to make itself felt on the forward market before about April or May and on this basis the buffer stock manager at best cannot expect to acquire before the end of this year the minimum 10,000 tons of metal stocks required before export controls become operative under the agreement. It is thus virtually certain that, whatever the outlook may be in 1957, the impact of quota restrictions on the industry this year should be virtually nil. Moreover, if producers elect to make any substantial part of their contribution to the stockpile in cash (which at the present high price of the metal—£70 above the floor price—seems probable enough) the operation of quotas may be delayed well into next year.

Latest news of the threatened strike in the Malayan Tin Mines (referred to here last week) is that the mineworkers have asked the Malayan Mining Employers' Association for a bonus payment, under the guise of an application for pay lost during the four years of Japanese occupation! Given the fact that you intend to get a pay increase anyway, one excuse is presumably as good as another. The nationwide strike of

Government employees' is no nearer solution but no positive action is expected before February 20. A union meeting has been called for that date, which coincides with the return of Tengku Abdul Rahman from London.

The Bolivian Ambassador in Washington this week made the somewhat unexpected prediction that Bolivia tin mines will one day return to private ownership. He pointed out that Bolivia was now undertaking the first of three steps that would eventually result in the return of the properties to "investor-financed ownership". The mines which are at present held by a Government owned corporation would, he said, in due course be handed over to a mixed firm sponsored by both government and private capital, which would evolve eventually into a privately-owned organization. While it may well be that the chaotic conditions to which state management is widely believed to be reducing the mines, may provide the Bolivian Government with every incentive to free itself of this liability, it is quite another question whether the mines can in fact be returned to private ownership on any basis which would make the investment attractive to the private investor. The experience of the de-nationalization of mines in other parts of the world (such for example as the coal mines in Australia) has been that private capital has an annoying habit of being selective in its purchases and in the end the State is apt to find itself with the uneconomic mines left on its hands. Admittedly, the Bolivian proposal would appear to be for a package offer rather than for an auction in detail, but it by no means follows that this can be made attractive.

International Tin Study Group figures for 1955 world mine output is 168,000 tons, about 0.9 per cent less than in 1954. Malaya's output was 61,425 tons and the estimated outputs of the Coneo, Siam, Nigeria, and Indonesia, are: 15,208, 10,875, 8,060, 33,368. Bolivian exports were estimated at 27,400 tons.

#### THE LONDON METAL MARKET PRICES

	February 8		February 15	
	Buyers	Sellers	Buyers	Sellers
<b>Copper</b>				
Cash	£398½	£399	£400½	£401
Three months	£379	£380	£384	£384½
Settlement	£399		£401	
Week's turnover*	4,050 tons		4,150 tons	
<b>Tin</b>				
Cash	£786	£788	£802½	£805
Three months	£767	£768	£773	£775
Settlement†	£788		£805	
Week's turnover*	775 tons		740 tons	
<b>Lead</b>				
Current half month	£115½	£115½	£118½	£118½
Three months	£112	£112½	£114½	£114½
Week's turnover*	5,275 tons		3,700 tons	
<b>Zinc</b>				
Current half month	£98½	£98½	£100	£100½
Three months	£94½	£95	£96	£96½
Week's turnover*	4,625 tons		3,700 tons	

\* 4½ days. † On Wednesday morning the Eastern price was equivalent to £787½ per ton c.i.f. Europe.

**ANTIMONY.**—Antimony from China, the U.S.S.R. and other sources, mainly beyond the Iron Curtain, is being offered on the Continent at discounts of up to £50 below London prices for metal of equivalent grades.

**CHROME.**—The Government of India has decided to regulate exports of chrome ore during the year 1956 on a quota basis, through shippers who exported the ore during any of the three calendar years 1953, 1954, 1955. Shippers have been advised that by February 15 they should have established their best year's exports with the export trade control authorities at the port through which these shipments were made.

**MAGNESIUM.**—For the first time in several years Dow Chemical Corporation is operating its magnesium plants in Texas, at Freeport and Velasco at the full annual capacity rate of 75,000 tons. The company has stated that any excess capacity will be used in building up inventories of metal in anticipation of an increased demand.

**PLATINUM.**—Demand from the petroleum industry has slackened slightly, reports Comtel-Reuter from New York, but overall consumption remains at a high level and the supply situation is on the tight side. Consequently, the trade feels that the easier price tone which has recently prevailed in the U.S. tend to firm up in the near future. Meanwhile, primary sellers are still quoting \$97/99 per f.oz. and are allocating larger quantities to their regular trade.

**TITANIUM.**—Not more than twelve companies have so far entered the field of titanium metal production on a large scale, and there has been keen competition between them to im-

prove extraction techniques so as to cheapen their product. In consequence, the price of first-grade titanium sponge-metal in the U.S. dropped in five successive reductions to \$3.45 per lb. from \$5 at the beginning of 1954. Now comes the news that Imperial Chemical Industries have brought down the price of their raw titanium to about 21s. (below \$3) making British titanium the cheapest in the world. The availability of titanium at a relatively low price is likely to have industrial importance by no means confined to the aircraft industry. It is evident, therefore, that once again the British chemical industry is making an outstanding contribution to world progress in a new and important field. In August, 1953, I.C.I. announced that they were going to build a plant to produce 1,500 tons of titanium a year by a new sodium process of their own development. This plant came into operation last year, less than two years after planning was started. I.C.I.'s titanium has important advantages in its physical form. Instead of the coke-like "sponge" of the conventional Kroll process, the titanium is in the form of small granules which can be pelleted with alloying materials into a form ideal for the difficult process of melting.

**TUNGSTEN.**—The U.S. General Services Administration (GSA) has concluded an agreement with the O'Kiep Copper Company of South Africa to reduce the amount of tungsten required for the U.S. national stockpile. At the beginning of the Korean war GSA contracted with the company to accept delivery of 120,000 s.ton units of tungsten up to March 31, 1958. This contract involved an expenditure of about \$7,000,000. GSA state that deliveries resulting from its efforts to encourage domestic producers, as well as reduced needs, have enabled the planned expenditure to be reduced by \$2,429,000, adding that O'Kiep Copper "was agreeable to the cutback".

#### OTHER LONDON PRICES — FEBRUARY 15

##### METALS

Aluminium, 99.5%	£179 per ton	Nickel, 99.5% (home trade)
Antimony—		£519 per ton
English (99%) delivered, 10 cwt. and over £210 per ton		Osmium, £24/27 oz. nom.
Crude (70%) £200 per ton		Osmiridium, nom.
Ore (60% basis) 23s. 6d./		Palladium, £8 0s./£8 10s. oz.
24s. 6d. nom. per unit, c.i.f.		Platinum U.K. and Empire
Bismuth		Refined £32 10s. oz. Imported
(min. 1 ton lots) 16s. lb. nom.		£39 0s./£41 0s. oz.
Cadmium 12s. 0d. lb.		Rhodium, £40/£42.
Chromium, 6s. 11d. lb.		Ruthenium, £16/£18 oz.
Cobalt, 21s. lb.		Quicksilver, £87 0s. ex-warehouse
Gold, 24s. 5½d.		Selenium, 72s./112s. nom. per lb.
Iridium, £29/31 oz.		Silver, 79½d. f.oz. spot and 79½d. f.d.
Manganese Metal (96%—98%) £269 according to quantity		Magnesium, 2s. 4d. lb.
Manganese Ore		Tellurium, 15s./16s. lb.

##### ORES, ALLOYS, ETC.

Bismuth .. .. .. ..	65% 8s. 6d. c.i.f.
	18% 20% 1s. 3d. lb. c.i.f.
Chrome Ore—	
Rhodesian Metallurgical (semifriable) 48%	£15 2s. 6d. per ton c.i.f.
Refractory 45% ..	£14 2s. 6d. per ton c.i.f.
Smalls 42% ..	£12 2s. 6d. per ton c.i.f.
Magnesite, ground calcined ..	£27 10s./£28 10s. d/d
Magnesite, Raw ..	£11 10s./£12 10s. d/d
Molybdenite (85% basis) ..	8s. 2½d. nom. per lb. c.i.f.
Wolfram and Scheelite (65%) ..	264s. 0d./269s. 0d. c.i.f.
Tungsten Metal Powder (98% Min. W.) ..	21s. 0d. nom. per lb. (home)
Ferro-tungsten (80%—85%) ..	18s. 0d. nom. per lb. (home)
Carbide, 4-cwt. lots .. ..	£39 3s. 9d. d/d per ton
Ferro-manganese, home .. ..	£59 10s. 0d. per ton
Manganese Ore Indian c.i.f.	
Europe (92%—97%) basis 110s. freight ..	90d./95d. per unit c.i.f.
Manganese Ore (82%—87%) ..	80d./85d. per unit c.i.f.
Manganese Ore (67%—70%) ..	65d./68d. per unit
Brass Wire .. ..	3s. 7½d. per lb. basis
Brass Tubes, solid drawn .. ..	3s. 0d. per lb. basis

The printing dispute, now in its fifth week, has led to a change in content and a reduction in size of *The Mining Journal*.

Our two regular features, "Mining Markets" and "The London Metal Market", have been omitted, while the L.M.E. prices for copper, lead, tin and zinc are those ruling after the close of the morning ring on Wednesday. *The Mining Journal* is not a party to the dispute.

## COMPANY SHORTS

**Kaffir Gains Maintained.**—Equity prices on the London Stock Exchange opened firm on Wednesday morning, due largely to the announcement after market hours that President Eisenhower had received a clean bill of health from his doctors. Yet the gains established at the outset were not held and prices settled down at levels near those prevailing on the previous day. After a poor start some improvements were noticeable in Kaffirs. Apart from selected coppers other mining shares showed little change.

In the O.F.S. section Ofsts moved up 1s. 6d. to 61s. 6d.; Welkom put on about 1s. 3d. to 21s. 9d., while F.S. Geduld advanced to over £4. On the Far West Rand, Buffels advanced 1s. to about 29s. 3d. while Harties improved 6d. to 35s. 6d. Vaal Reefs hardened 1s. to 32s. 6d. and West Dries settled at around £5 $\frac{1}{2}$ .

Tins on the whole lost the turn. Resumption of work by waterside-workers made little difference to Australian lead-zincs. Amongst coppers R.S.T. advanced 1s. to 48s. 6d., and Rhokana put on 10s. to £41 $\frac{1}{2}$ .

**Bancroft Mines.**—A progress report covering the period July 1 to December 31, 1955, has disclosed some interesting diamond drilling results. Borehole K.L.B.50—put down to site a position for No. 3 Shaft—intersected at 448 feet a true width of 4.62 ft. assaying 4.94 per cent total copper of which 3.28 per cent was oxide and .03 per cent cobalt. Borehole K.L.B.51 on the southern extension of Kirila Bomwe South Orebody was stopped at 663 feet having passed through orebeds between 573 and 627 feet. Average assay was 4.50 per cent total copper of which 1.96 per cent was oxide and .098 cobalt over a true width of 21.12 feet.

The initial sinking of No. 1 shaft on Kirila Bomwe South Orebody has been completed. During the second half of the year the orebody was intersected by horizontal boreholes drilled underground. Values were 4.70 per cent copper. Oxide ore averaged 2.12 per cent. Cobalt amounted to .057 per cent. On the Konkola Orebody No. 2 shaft was sunk to 1,274 ft.

**Afrikander's Higher Uranium Profits.**—Due to an improvement in overall extraction at the Stilfontein treatment plant, The Afrikander Lease's uranium working profit—after deducting gold losses—for the quarter ended December 31, 1955, advanced to £22,310 from £14,914 during the previous quarter. Owing to an adjustment arising from an alteration in the basis of allocation between contributors in the Joint Uranium Scheme, however, an amount of £6,419 fell to be deducted from profits leaving the net position showing at £15,891 a gain of only £977. This figure made no allowance for £2,120 (same) payable in respect of uranium loan instalments. There was no taxation liability. These figures were published by Central South African Land and Mines, which owns about 77 per cent of The Afrikander Lease.

**Kentan's December Quarterly.**—A quarterly report in respect of three months ended December 31, 1955, issued by Kentan Gold Areas on behalf of Geita Gold Mining Company of which it owns nearly 79 per cent, shows mill throughput down at 65,600 tons from 67,100 tons during the final quarter of 1954. Fine ounces of gold produced declined to 9,960 from 10,253. Working profits fell to £10,032 from £12,398. Lateral development on the North East Extension Block continued during the quarter from Adit No. 535 principally towards the north where two bodies were partly delimited on 3 Level. On 4 Level lateral development proceeded in the hanging wall and was supplemented by cross cutting and diamond drilling to probe for the downward extension of the orebodies developed on 3 Level. At Prospect 30 a further extension of the orebody was proved.

**Sharp Rise in Petaling's Profits.**—Profit from mining operations during the year ended October 31, 1955, earned by Petaling Tin jumped to £571,140 from £374,681 during the previous year. After allowing for increased dividends at 85 per cent (42 $\frac{1}{2}$  per cent) on the issued ordinary capital of £513,333 which absorbed £305,433 as compared with £152,717, and appropriations of £470,213 (£246,689) the balance carried forward moved up to £122,878 from £115,369.

In view of the large amounts of previously dredged ground due to be re-treated, a somewhat lower rate of output was expected during the current year. But provided introduction of the International Tin Agreement did not result in a serious curtailment of production or fall in tin prices, prospects were not regarded as being unfavourable. During the three months ended December 31, 1955, Petaling produced 379 $\frac{1}{2}$  tons of tin 98% as against 485 $\frac{1}{2}$  tons during the preceding quarter.

**Cons. Tin Mines of Burma.**—Still without access to its mining areas in Burma, The Consolidated Tin Mines of Burma could not control production of tribute ore during the year ended March 31, 1955. Besides this difficulty, the operation of more favourably placed competitors in local ore purchasing adversely affected earnings. In the circumstances, material handled by the company declined to 175 tons from 296 tons during the previous year and profits after taxation suffered a marked reduction to £7,242 from £15,763. Dividends were, however, maintained at 7 $\frac{1}{2}$  per cent on the issued ordinary capital of £318,088 in shares of 5s. But the balance carried forward fell to £22,218 from £28,724.

Every endeavour continues to be made to promote the resumption of mining operations. And as Mr. W. J. C. Richards, the chairman, is shortly expected to return from Burma his statement to shareholders (to be circulated later) will give the latest information on this matter. Meeting, London, February 23.

**Fanti Maintains 12 $\frac{1}{2}$  Per Cent.**—With the declaration of an interim dividend of 7 $\frac{1}{2}$  per cent together with a bonus of 5 per cent in respect of the year ended December 31, 1955, Fanti Consolidated Investment Company has maintained at 12 $\frac{1}{2}$  per cent distribution on its £557,000 ordinary stock. Subject to completion of audit, profits totalled £55,881 (£53,562). These figures were struck after taxation of £63,072 and £75,816 respectively. After transferring £15,000 (same) to general reserve, carry forward rose to £19,697 from £18,850.

**Mt. Isa Copper Refinery.**—The company is considering the construction of an £A2,000,000 copper refinery at Stuart, Queensland. The final decision on whether to carry out the project or not is expected to be taken towards the end of the current month. The company has already bought land in the area and will send blister copper for refining from Mt. Isa. No decision has yet been taken, states Countel-Reuter, on whether the end-product will be fire-refined or electrolytic.

**Record Net Profit for Kennecott.**—During the final quarter of 1955 Kennecott Copper Corporation—America's largest copper producer—earned \$4.03 a share as compared with \$1.83 in the corresponding quarter of 1954. This was a record for the company.

**Mount Isa to Make Stock Split.**—A sub-division of Mount Isa Mines' £A1 stock units into four units of 5s. will be proposed at an extraordinary meeting of the company to be held on February 29. At present the company's authorized capital is £A10,000,000 of which £A5,757,312 is in issue.

**Rio Tinto to Make Rights Issue.**—For the purpose of financing new developments in the next phase of its exploration programme, estimated to cost between £4,000,000 and £5,000,000, Rio Tinto proposes to make a rights issue of ordinary shares. Depending upon market conditions, the operation is expected to take place about the middle of March. Terms, etc., are still to be fixed.

**San Francisco Mines of Mexico.**—Fixed assets as at September 30, 1955, were £1,114,280 as compared with £1,110,606. Current assets—including cash of £2,432,502—improved slightly to £4,510,511 from £4,477,669. Current liabilities totalled £667,149 (£572,316). Other provisions, including taxation, amounted to £719,965 (£796,582). Net profits after taxation were sharply increased at £489,579 as against £294,622. Mr. C. E. Temperley is chairman. Meeting, London, February 20.

**Vereeniging Pays 2 $\frac{1}{2}$  Per Cent More.**—With the recommendation of a final dividend amounting to 22 $\frac{1}{2}$  per cent on its issued ordinary capital of £2,750,000 in stock units of £1, the Vereeniging Estates' total distribution for the year ended December 31, 1955, has been raised to a total of 32 $\frac{1}{2}$  per cent from the previous level of 30 per cent. Subject to audit, profits for the year after taxation and depreciation were £983,437 as compared with £945,823.

**Benguela Railway's Increased Operating Receipts.**—Preliminary results for the year ended December 31, 1955, issued by the Benguela Railway Co. reveal a rise in net operating receipts to Esc.157,566,201 from Esc.140,752,359. Total revenue amounted to Esc. 392,562,883 as compared with Esc.360,957,547 and working expenses to Esc.234,996,682 as against Esc.220,224,188. Tanganyika Concessions owns all the debentures and 90 per cent of the equity of The Benguela Railway.

**Nigel Van Ryn Reefs.**—Quoted investments as at September 30, 1955, had a market value of £317,077 (£266,643). This compared with a balance sheet valuation of £250,500 (£193,930). Current assets increased to £287,222 from £243,622. Current

liabilities declined to £18,102 from £27,900. Due mainly to a non-recurring profit from sales of shares, net profits after taxation expanded to £65,605 from £29,945. Major Sir Cyril F. Entwistle is chairman. Meeting, London, March 21.

**Lyndhurst Deep to be Wound Up.**—At an extraordinary general meeting of Lyndhurst Deep-Level (Gold and Silver) held in London on January 24 it was resolved that the company should be voluntarily wound up. Liquidators were accordingly appointed. Transfers of shares will be accepted for registration until the close of business on February 28, 1956. At that date transfer books and registers of members will be finally closed.

**Chartered's Higher Dividend.**—With the recommendation of a final dividend amounting to 23½ per cent on its issued capital of £13,140,753 in registered and bearer stocks and shares of 15s., total distribution by the British South Africa Company for the year ended September 30, 1955, has been raised to 30 per cent. This compares with 50 per cent paid on the previous issued capital prior to the 100 per cent scrip issue. After provision for tax of £6,211,779 (£5,143,661) net profits increased sharply to £5,617,645 from £3,295,898.

**Ribon Valley (Nigeria) Tinfields.**—A fall in cash holdings to £399 from £27,736 was largely responsible for reducing current assets at March 31, 1955, to £26,400 from £50,462. Balance sheet valuation of fixed assets remained virtually unchanged at £85,331 (£85,942). Contributions to cost of assets under agreements with associated companies was stated at £50,953. Trade investment at cost amounted to £11,553. Net profit after taxation totalled £2,921 (£872). No dividend was paid. Mr. A. Hedley Williams is chairman. Meeting, London, February 14.

**Paringa Mining and Exploration Company.**—The company's wholly owned subsidiary—Paringa Wheal Fortune Pty.—had a balance sheet value as at August 31, 1955, of £111,100. Other investments shown at £14,752 had a market value as at August 31, 1955, of £20,136. Current assets increased to £34,813 from £24,893. Current liabilities at £35,732 compared with £29,563. Net profits were £7,893 (£402). The adverse balance carried forward declined to £314,560 from £318,558. Mr. Thomas Kenny is chairman. Meeting, London, March 9.

**No Change in Rambutan's Fixed Assets.**—During the year ended 1955 Rambutan's balance sheet entry of £45,000 remained unchanged. Mainly due to a substantial rise in cash holdings current assets increased to £145,279 from £103,310. Current liabilities also moved up to £37,011 from £13,385. An amount set aside for future taxation of £23,180 compared with £9,113. Net profits after taxation totalled £24,022 (£10,993). Mr. Donald W. Thomas is chairman. Meeting, Redruth, Cornwall, February 20.

**Slight Fall in Falcon's Profits.**—The quarterly report for three months ended December 31, 1955, from Falcon Mines discloses a slight fall in profits to £28,280 from £31,765 during the September quarter. There was again no liability for taxation. Total footage advanced at the Dalny Mine amounted to 2,444 ft. of which footage sampled in drives, raises and winzes totalled 1,405 ft. at 69 per cent payability. Average values obtained were 8.0 dwt. per ton over a width of 65 in. During the previous quarter 935 ft. were sampled of which 72 per cent was payable averaging 5.86 dwt. per ton over 65 in.

**Motapa Mills More.**—Ore milled by Motapa Gold Mining Company during the three months ended December 31, 1955, moved up to 54,000 tons from 51,750 tons during the quarter ended September 30, 1955. Mill grade declined to 2.756 dwt. per ton from 2.772 dwt., but working profits increased to £7,809 from £7,223. Development proved on the strike of the ore-bodies amounted to 1,080 ft. of which 190 ft. was payable averaging 3.3 dwt. per ton over 18.4 ft. This compares with 1,445 ft. of which 300 ft. was payable with an average value of 3.3 dwt. per ton over a width of 14.3 ft. during the previous quarter.

**Bibiani Makes Loss in 1955 December Quarter.**—Due to the strike of African labour at Bibiani (1927), a loss of £29,492 was incurred during the final quarter of 1955. This compares with a profit of £45,297 during the previous corresponding period of 1954. Output amounted to only 49,000 s.tons which yielded 10,225 oz. of gold valued at £127,920. During the last three months of 1954, 89,000 s.tons were crushed from which 19,350 oz. of gold were obtained valued at £242,920.

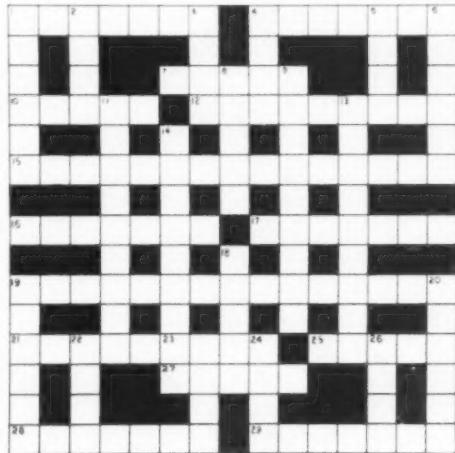
**Strike Hits Ashanti's Profits.**—The strike of African employees at Ashanti Goldfields Corporation lowered total estimated profits for the three months ended December 31, 1955, to £24,823 from £210,241 in the last quarter of 1954. Production during the quarter totalled 35,500 s.tons of ore, yielding 29,058 oz. of gold, with an estimated value of £363,191. This

compares with 78,000 tons milled during the corresponding period of 1954, from which 49,130 oz. of gold were produced, valued at £616,786. A point of particular interest in the report concerned the Eaton Turner Shaft. The 2,000 ton ore-bin was almost completed while satisfactory progress was made with the assembly or "C" conveyor on the ground. Preparation was also made for trestle foundations.

**John Summers' Expansion.**—A considerable improvement in results was achieved by John Summers and Sons during the year ended October 1, 1955. This, as Mr. Richard F. Summers, the chairman, explained to shareholders, was mainly due to increased profits earned by the parent company, arising from favourable trading conditions, higher production and greater operating efficiency. The recent large expansion in plant has thus proved to have been justified.

Year to Oct. 1	Total Profit £(000)	Taxa- tion £(000)	Net Profit £(000)	Divi- dends £(000)	To Reserve £(000)	Carry Forward £(000)
1955	8,670.4	2,778.8	2,897.8	747.5	2,747.5	457.4
1954	5,243.7	1,636.0	1,659.1	530.4	1,530.4	307.1

Last year Mr. Summers disclosed that an investigation into the possibility of increasing target production to 1,250,000 tons of crude steel was taking place. It had subsequently been decided, he said, that steel output could be further raised to 1,600,000 or 1,700,000 tons per year. Certain modifications would be necessary to handle this additional tonnage, but the company should ultimately be in the position to deliver annually about 1,250,000 tons of finished products. The cost of this extra development would be about £16,500,000. Necessary approvals have been obtained and the work begun and completion is expected some time in 1958. Most of the capital expenditure envisaged would, it was hoped, come out of the company's own resources. But during the expansion period shareholders should not expect too much in the way of higher dividends. Meeting, London, February 22.



'UNICONE' CROSSWORD No. 15

**ACROSS**—1. It's rotten but keep going! (7). 4. Princes are at home in them (7). 7. A sudden attack (5). 10. Consumed about one (5). 12. To 10 across perhaps (9). 15. There's pressure behind this prophecy (7, 8). 16. High priest (7). 17. Comes after most things but before the picture (7). 19. Their advent is often prophesied by 15 across (4, 11). 21. Sacred (9). 25. It's finer in a way (5). 27. Hold up (5). 28. Tam returns to the entrance (7). 29. Sounds a friendly type behind the Iron Curtain (7).

**DOWN**—1. The cow has swallowed everything (6). 2. Accompanies (15) across usually (4). 3. There's no getting back in this direction (4). 4. Metre is his metier (4). 5. Accountant gets round the order (4).

*With the compliments of*



THE 'UNICONE' CO. LTD., RUTHergLEN, GLASGOW, SCOTLAND  
MAKERS OF UNICONE FLEXIBLE JOINTS FOR ALL PIPELINES

*Solution on page 212*

## MINE RETURNS

## SOUTHERN RHODESIAN GOLD

Company	December, 1956			Current Financial Year Total to date			Last Financial Year Total to date		
	Tons (000)	Yield (oz.)	Profit (£'000)	Tons (000)	Yield (oz.)	Profit (£'000)	Tons (000)	Yield (oz.)	Profit (£'000)
Arcturus	2,911,131	5.2	6	18,36,6551	28.9	18,25,526	19,2		
Cam & Motor	19,57,006	228.6	6	139,55,598	233,6	144,5,45,350	249,0		
Falcon Mines	19,03,278	6,5	6	35,21,032	26,4	52,1	9,527	34,5	
Globe & Phoenix	6,3,657	22,3	12	72,7,43,265	27,9	72,8,43,086	281,0		
Motapa Gold*	18,02,497	2,6	12	200,3,27,508	18,5	218,2,29,996	38,5		
Muriel Mine	3,2,1,159	10,6	6	19,8,6,332	61,2	18,7	5,789	60,4	
Phoenix Prince	31,9,3,807	9,5	9	97,3,11,462	30,5	92,6,11,702	25,4		
Tebeke	3,5,1,096	5,7	6	36,4,5,973	20,7	48,9	—	15,6	

\* Excluding premium gold sales. L indicates a loss.

a Reduced output due to breakdown of rock host.

b This figure includes additional profit from accumulated concentrates retreated from all 3 mines.

## AUSTRALIAN GOLD

Company	4 weeks to Dec. 27 1955		4 weekly period since year-end		Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Central Victoria	87.3	371	10	852.6	3,372	1470.6	4,422	
Central Norseman	12.5	7,289	10	133.7	76,089	121.5	63,301	
Great Boulder*	114.12,6863	12	436.6	105,625	432.5	99,572		
Gold Mines of Kalgoorlie	40,012,072a	10	377.9	96,685	153.0	42,483		
Gt. Western Cons.	34.9,6,057	10	337.4	47,754	328.9	42,308		
Morning Star	1.0,316b	10	13.2	4,018	13.2	8,792		
North Kalgoorlie	28.0,6,217	13	348.9	76,184	242.1	55,859		

\* Quarterly

a Including 1,193 oz. in conc.

b No production on 2 days statutory holiday and maintenance.

## INDIAN GOLD

Company	December 1955		Months since year-end		Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Champion Reef	14.4	5,104	12	172.5	61,67	177.1	69,571	
Mysore	20.6	6,088	12	201.3	62,432	219.1	78,252	
Nundydroog*	20.1	5,648	12	229.2	76,331	251.6	71,941	

\* Includes tailings.

## MISCELLANEOUS GOLD

Company	December 1956		Months since year-end		Current Financial Year Total to date		Last Financial Year Total to date	
	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)	Tons (000)	Yield (oz.)
Br. Gu. Consol.*	121.1	1,093	12	1853.3	17,723	2331.3	21,026	
Clutha River*a	173.0	283	10	2380.0	4,375	2175.0	4,200	
Frontino	11.8	6,101	12	140.2	75,848	125.7	69,303	
Kentan (Geita)	20.8	3,200	6	135.2	20,247	133.2	20,476	
St. John d'El Rey	26.2	115	12	305.4	1,412	317.8	1,466	

\* Cu. yd. dredged. a Dec. 9 to Jan. 6.

## CORRECT SOLUTION TO "UNICONE" CROSS-WORD No. 15 APPEARING ON PAGE 211

ACROSS : 1. Carrion; 4. Palaces; 7. Onset; 10. Lunch; 12. Entertain; 15. Weather forecast; 16. Prelate; 17. Trailer; 19. Deep depressions; 21. Plundered; 25. Infer; 27. Delay; 28. Doormat; 29. Kindred.

DOWN : 1. Callow; 2. Rain; 3. None; 4. Poet; 5. Coma; 6. Signet; 8. Snuff; 9. Terrorist; 11. Cattle Pen; 13. Tactician; 14. Feathered; 18. Creel; 19. Depend; 20. Sordid; 22. Undo; 23. Rent; 24. Dark; 26. Fair.

## AGENCE MINIÈRE ET MARITIME S A

2, RUE VAN BREE — ANTWERP — BELGIUM

Sworn weighers, samplers of ores, metals and residues. Agents for shippers at European ports and plants.

Market surveyors and advisers assuring sales direct to consumers. Telegrams : Rentiers-Antwerp

## MINE RETURNS

## OIL OUTPUT

Company	December		Monthly Since Year End		Cumulative Totals (in tons)	
	Dec.	ton (tons)	Year End	This year to date	Last year to date	
Anglo Ecuadorian	27,655	9	245,629	246,178		
Apex Trimidad	36,958	3	110,391	113,318		
Attock Oil	50,946	12	198,184	182,834		
Kent Oils	27,942	7	184,666	184,602		
Kent Oil	000,000	00	000,000	000,000		
Lobitos Oil	43,805	12	526,771	498,204		
Qatar Petroleum	467,655	11	4,905,461	4,274,882		
Trimidad Central	7,200	12	96,263	105,044		
Trimidad Leasholds	82,295	6	474,664	485,143		
Trimidad Petroleum	48,437	5	233,521	205,106		
Ultramar Oil*	110,448	12	1,293,051	1,312,589		

Note: 1 ton taken to equal seven barrels.

\* Output figures are for S.A.P. Las Mercedes in which Ultramar holds a 50 per cent interest.

## COAL OUTPUT

Company	December		Months Since Year End		Cumulative Totals (in tons)	
	Dec.	ton (tons)	Year End	This year to date	Last year to date	
Amal. Coll. of S.A.	548,134	12	6,881,884	6,903,319		
Apex	79,075	12	101,650	97,319		
Blesbok	48,022	12	552,277	529,724		
Coronation	84,925	12	1,060,029	1,050,490		
New Clydesdale	81,965	6	470,775	447,316		
New Largo	100,998	12	1,213,651	1,004,732		
S.A. Coal Est.	141,934	6	830,103	818,332		
Springvale	72,765	12	870,541	831,384		
Transvaal & Delagoa	116,995	4	492,089	499,186		
Van Dyk's Drift	65,027	12	707,512	618,470		
Vierfontein	107,884	12	1,327,529	988,724		
Vryheid Cor.	56,492	12	588,666	508,276		
Vryheid Cor.*	42,272	12	477,073	425,751		
Wankie Col.	307,676	4	1,209,756	1,104,089		
Wankie Col.*	17,556	4	71,851	63,548		
Witbank	144,923	12	1,787,148	1,618,657		

## COKE

## TIN OUTPUT IN TONS OF TIN CONCENTRATES

Company	Dec.		Monthly Since Year End		Financial Year to Date		Company	Dec.		Monthly Since Year End		Financial Year to Date	
	This	Last	This	Last	Company	Dec.	This	Last	Company	Dec.	This	Last	
EASTERN					Taiping				Tambah				
Ampat	145	12	1410	1242	Tambah	59	12	163	Tambah	124	1171	776	776
Ayer Hitam*	1301	6	1379	1389	Tanjong	101	12	1117	Tanjong	12	1171	900	900
Berjuntai	491	8	542	549	Tekka	37	9	104	Tekka	110	110	110	110
Chenderiang*	531	9	164	174	Tekka Taiping*	38	12	174	Tekka Taiping*	110	110	110	110
Gopeng Cons.	2031	3	2031	178	Temoh*	74	3	74	Temoh*	33	33	33	33
Hongkong Tin*	139	3	139	94	Tongkah	47	3	47	Tongkah	35	35	263	263
Idris Hydraulic	911	12	309	286	Tronch*	826	12	2794	Tronch*	2594	2594	2594	2594
Ipoh Tin	152	9	1385	812	Tambang	59	12	163	Tambang	124	1171	646	646
Kamunting	152	12	260	359	Amal. Tin	387	9	3177	Amal. Tin	124	1171	2324	2324
Kent (F.M.S.)*	522	6	1612	122	Amal. Tin†	46	9	413	Amal. Tin†	124	1171	447	447
Kepong*	873	8	873	53	Bischi	81	12	760	Bischi	124	1171	666	666
Killinghall	873	8	873	53	Bischi†	393	12	379	Bischi†	124	1171	302	302
Kinta Kellas	000	00	000	00	Ex Lands	83	12	600	Ex Lands	124	1171	610	610
Kinta Tin	261	12	378	352	Gol & Base	66	12	582	Gol & Base	124	1171	510	510
Klang River	213	9	203	220	Gol & Base†	20	12	183	Gol & Base†	124	1171	150	150
Kramat Tin	252	9	286	273	Gol & Base†	25	3	51	Gol & Base†	124	1171	50	50
Kuala Lumpur	572	3	209	124	Jantar	23	3	59	Jantar	124	1171	54	54
Larut Tin	872	12	1294	794	Kaduna P.	34	12	630	Kaduna P.	124	1171	70	70
Lower Perau	241	8	1672	1304	Kaduna S.	26	12	245	Kaduna S.	124	1171	332	332
Malayan Tin	708	12	1291	794	Keff†	37	9	360	Keff†	124	1171	81	81
Malaysian	122	9	1183	794	Naraguta Ex.	132	12	1093	Naraguta Ex.	124	1171	81	81
Pahang Cons.	180	5	1022	1100	Naraguta R.	132	12	1371	Naraguta R.	124	1171	1771	1771
Pengkalan*	1213	3	1213	1213	Naraguta Tin	132	12	1542	Naraguta Tin	124	1171	1931	1931
Petaling*	379	3	379	440	Naraguta Tin†	132							

**ASSAYER.** experienced analysis and assay all classes metallurgical materials—ores, alloys, residues, etc., seeks position with mining company overseas. Write: 89 Berwick Road, Welling, Kent.

**DUTCH MINING ENGINEER—GEOLOGIST, M.A.** Dr. Technical Sciences, seeks employment as Manager, Resident Chief Geologist or Chief of Exploration Programme. 35 years' experience in coal, oil and metal mining. Go anywhere; preferably Africa or Canada. Fluent English, French, German, Dutch, Spanish, Portuguese, Swahili, working knowledge of Malay. Age 58. Excellent health. At present employed in Central Africa. Available on three months' notice. Write Box 576, The Mining Journal, 15 Wilson Street, Moorgate, London, E.C.2.

- (a) **SENIOR MINE AGENT.**
- (b) **MINING GRADUATE HAVING LESS THAN THREE YEARS' POST GRADUATE EXPERIENCE.**
- (c) **METALLURGIST FOR RESEARCH AND SUPERVISORY DUTIES.**

The above three vacancies occur on a metal mine abroad. The tour of duty is 2½ years followed by six months leave on full pay. Furnished house, light and water free. Free passages for employee, wife and family. Salary details on application. Write stating position required to Box 563, Walter Skinner Ltd., 20 Copthall Avenue, London, E.C.2.

**METALLIFEROUS MINING SCHOLARSHIPS.** Two Awards of £300 and three of £150 p.a., from October, 1956 (Provided by Metalliferous Mining Companies) for 3-year Metalliferous Mining course at Royal School of Mines, for Degree and A.R.S.M. Application forms from Registrar, Imperial College, London, S.W.7, to be returned by March 31, 1956.

#### AUSTRALIA—UNIVERSITY OF SYDNEY

Applications are invited for appointment to a permanent **SENIOR RESEARCH FELLOWSHIP IN COAL RESEARCH** within the Department of Geology and Geophysics. The appointee will be required to plan and undertake research on occurrence, nature or utilization of coal. Applicants should be graduates in Science or Chemical Engineering with experience in coal research.

The salary will be within the range £A1,200—£A80—£A1,750 per annum, plus cost-of-living adjustment (£A26 men, £A20 women), and will be subject to deductions under the State Superannuation Act. The commencing salary will be fixed according to the qualifications and experience of the successful applicant.

Finance available for home purchase under Staff Members' Housing Scheme.

Applications with details of qualifications, experience, names of referees, and enclosing a recent photograph, should reach the undersigned by March 17, 1956.

Candidates outside Australia and New Zealand are required to forward a copy of the application to the Secretary of the Association of Universities of the British Commonwealth, 36 Gordon Square, London, W.C.1, by the same date.

S. Weir Wilson, Acting Registrar, University of Sydney, New South Wales, Australia.

## BALLS!

TRY OURS FOR INCREASED PRODUCTION!

FROM  
1" to  
4½" dia.



Hand Forged from Tough High Carbon or Alloy Steels.

Also **HAND TOOLS, DRILL STEEL ETC.**, for QUARRY and MINING WORK by

**F.J. BRINDLEY & SONS (SHEFFIELD) LTD.**

CENTRAL HAMMER WORKS SHEFFIELD 1

Telephone: 24201-2

## WOLVERHAMPTON DIAMOND DIE & TOOL Co. Ltd.

**BOARTS**  
*and*  
**INDUSTRIAL  
DIAMONDS**  
**Exporters**

**11 HATTON GARDEN,  
LONDON, E.C.1**

Telephone: HOLborn 3017 Cables: Pardimon, London

# Metal and Mineral Trades

## A. STRAUSS & CO. LTD.

FOUNDED 1875

PLANTATION HOUSE, MINCING LANE, LONDON, E.C.3

## METALS

Telephone: Mincing Lane 5551 (10 lines)  
Telegrams: Strauss Phone London

## RUBBER

Telephone: Mansion House 9082 (3 lines)  
Telegrams: Ascorub Phone London

## MERCHANTS

## EXPORTERS

## IMPORTERS

Non-Ferrous Metals — Virgin, Alloys, Scrap

RUBBER COPPER REFINERS

Sole Agents for MUREX Fire Refined Copper

Members of the London Metal Exchange

Dealer Members of the Rubber Trade Association

Members of the National Association of Non-Ferrous Scrap Metal Merchants

## CONSOLIDATED TIN SMELTERS, LIMITED.

ST. SWITHIN'S HOUSE, 11/12 ST. SWITHIN'S LANE, LONDON, E.C.4

Telephone MANSION House 2164/8

Telegrams CONSMELTER, PHONE, LONDON

PROPRIETORS OF THE FOLLOWING BRANDS OF LAMB &amp; FLAG AND STRAITS TIN

## ENGLISH

INGOTS &amp; BARS

MELLANEAR (99.9% Guaranteed)  
CORNISH MELLANEAR Common and  
PENPOLL Refined

## STRAITS

INGOTS—E. S. Coy., Ltd., Penang  
BARS—Penang Palm

BUYERS OF ALL CLASSES OF TIN ORES

Sole Selling Agents: VIVIAN, YOUNGER &amp; BOND, LIMITED

PRINCES HOUSE, 95 GRESHAM STREET, LONDON, E.C.2

Telephone: MONARCH 7221/7

Telex: LONDON 8665

Telegrams: BOND, STOCK, LONDON

Cables: BOND, LONDON

Telegrams: "BASSETT, PHONE, LONDON."

Telephone: MANSION HOUSE 4401/3.

## BASSETT SMITH & Co. Ltd.

(Incorporating George Smith &amp; Son)

15/18 LIME ST., LONDON, E.C.3

## METALS,

ORES (Copper, Zinc, Lead, &c., Complex),  
RESIDUES, SKIMMINGS & ASHES  
NON-FERROUS SCRAP

ESTABLISHED 1869

## BLACKWELL'S METALLURGICAL WORKS LTD.

THERMETAL HOUSE, GARSTON, LIVERPOOL, 19

MAKERS OF  
FERRO ALLOYS, NON-FERROUS ALLOYS  
RARE METALSBUYERS AND CONSUMERS OF  
COLUMBITE, TANTALITE, TUNGSTEN  
MANGANESE and all ORES

Works, Garston. Telegrams: Blackwell, Liverpool

Cable Address: WAHCHANG, NEW YORK

## WAH CHANG CORPORATION

(FORMERLY WAH CHANG TRADING CORPORATION)

233 BROADWAY

NEW YORK 7, NEW YORK

## TUNGSTEN TIN

## BUYERS

Tungsten Concentrates, Tungsten Tin Concentrates  
Mixed Tungsten Ores  
Tungsten Tailings, Scrap, Tips, Grindings  
Tin Concentrates—Tin Dross, Tin Furnace Bottoms

PLANT — GLEN COVE, NEW YORK

## SELLERS

Tungsten Concentrates to Buyers' Specifications  
Tungsten Salts, Tungsten Powder  
Tungsten Rods and Wires  
Tungsten Ingots, Tin Oxides, Tin Chlorides

## THE STRAITS TRADING COMPANY, LIMITED

Head Office :  
P.O. Box 700, OCEAN BUILDING, SINGAPORE  
Works :  
SINGAPORE & PENANG  
"The Straits Trading Co. Ltd."  
Brand of Straits Tin

## THE BRITISH TIN SMELTING COMPANY LIMITED

Works : LITHERLAND, LIVERPOOL  
Smelters of Non-ferrous Residues and Scrap

London Agents :  
**W. E. MOULSDALE & CO., LTD.**  
2 Chantrey House, Eccleston Street, London, S.W.1  
Cables : Wemoulance London Telephone : SLOane 7288/9

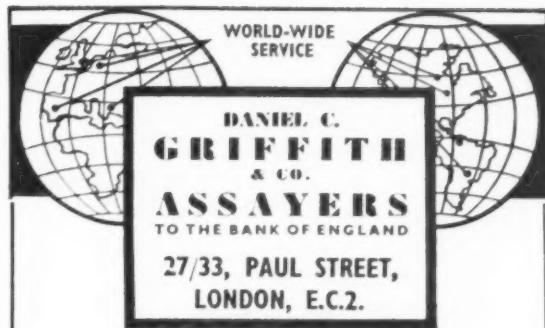
**FRANK & SCHULTE**  
Handelsgesellschaft m.b.H.  
(Incorporating Frank & Dieckmann G.m.b.H.)  
ALFREDSTRASSE 152 POSTBOX 515  
ESSEN, GERMANY  
Telegrams: Silizium Teleprinter No. 0857835 Telephone: 75921  
ORES MINERALS FERRO-ALLOYS  
METAL-ALLOYS METALS  
CHEMICALS REFRACTORIES  
Established 1922  
OFFERS AND AGENCIES SOLICITED

Telephone : AMHERST 2211 (six lines)

**E. AUSTIN & SONS**  
(London) LIMITED  
ATLAS WHARF  
Hackney Wick, London, E.9

Are Buyers of all scrap  
NON-FERROUS METALS,  
GUNMETAL, ALUMINIUM,  
COPPER, BRASS, LEAD, Etc.

Manufacturers of  
INGOT BRASS, GUNMETAL  
& COPPER ALLOYS, INGOT  
LEAD, TYPE METAL, ZINC,  
Etc.



Branch Office: LEFKA, Cyprus

Also at:  
BRISTOL  
BIRMINGHAM  
GLASGOW  
HULL  
LIVERPOOL  
NEWCASTLE  
S. WALES

Analytical Chemists, Samplers,  
Technical representatives in  
sales of Ores & Metals at all  
Ports and Works.

Also in:  
BELGIUM  
CANADA  
FRANCE  
GERMANY  
HOLLAND  
ITALY  
PORTUGAL  
SPAIN  
SWEDEN  
SWITZERLAND  
U.S.A.

Analyses of  
**PRECIOUS METALS  
BASE METALS  
ORES & RESIDUES  
Etc.**

Telephone : MONARCH 1314 (3 lines)

Telegraphic Address:  
"GRFFYDD, LONDON."

Telephone :  
MON. 5941-3  
**AYRTON METALS LIMITED**  
(Members of the London Metal Exchange)  
IMPERIAL HOUSE, DOMINION STREET, LONDON, E.C.2  
IMPORTERS AND EXPORTERS OF  
NON-FERROUS VIRGIN METALS, SCRAP,  
ALLOYS, ORES, MINERALS AND BY-PRODUCTS  
containing  
BASE AND PRECIOUS METALS  
DEALERS IN PLATINUM GROUP METALS  
ADVANCES MADE AGAINST CONSIGNMENTS  
U.S. Agents:  
The Ayrton Metal & Ore Cpn., 30 Rockefeller Plaza, New York 20, N.Y.

Telex, London 2-2475  
Cables: AYRTONMET  
International Telex :  
London 8547

## HENRY GARDNER & CO. LTD.

Non-Ferrous Metals  
and Semi-Manufactures,  
Ores, Minerals and Residues,  
Rubber  
Iron and Steel  
and General Merchandise

2 METAL EXCHANGE BUILDINGS,  
LONDON, E.C.3  
and at BIRMINGHAM, MANCHESTER, and GLASGOW

LEAD

ZINC

## THE ANGLO CHEMICAL & ORE CO. LTD.

(Members of the London Metal Exchange)

PALMERSTON HOUSE, BISHOPSGATE, LONDON, E.C.2.

Cables:  
"CHEMORE"Telephone:  
LONDON WALL 7255  
(8 lines)Telex:  
LONDON 8043

COPPER

TIN

### GEORGE T. HOLLOWAY & CO. LTD.

METALLURGISTS & ASSAYERS,  
ORE TESTING, WORKS AND  
METALLURGICAL RESEARCH LABORATORIESAtlas Road, Victoria Road, Acton,  
LONDON, N.W.10Telephone No.:  
ELGAR 5202Tels. & Cables:  
NEOLITHIC LONDON

### P. & W. MACLELLAN LTD.

129 TRONGATE, GLASGOW

NON-FERROUS METALS all classes  
INGOT SCRAP MANUFACTUREDLetters: P.O. Box 95 Glasgow  
Telegrams: Maclellan, Glasgow Telephone: Bell 3403 (20 lines)

EXPORT

K. WASSERMANN LTD.

IMPORT

127, KINGS CROSS ROAD, LONDON, W.C.1

FERRO-ALLOYS  
NON-FERROUS METALS : CHEMICALS

Cables: Metafe, London

Telephone: TERminus 8282-3-4

### J. LOWENSTEIN & CO. LTD.

GREENWICH HOUSE,  
10/12 NEWGATE STREET, LONDON, E.C.1  
Telephone: City 8401 (7 lines)

ORES - METALS - RESIDUES

MINING &  
CHEMICAL  
PRODUCTS  
LIMITED86 Strand  
London WC2  
Telephone  
Temple Bar  
6511/3Buyers of Ores,  
Concentrates  
and Residues of  
**BISMUTH**  
**SILVER**  
**SELENIUM**

### EVERITT & CO. LTD.

Teleg. Address: Persistent, Liverpool

40 CHAPEL STREET  
LIVERPOOL  
Phone: 2995 Central

## SPECIALITY:

MANGANESE PEROXIDE ORES

We are buyers of:  
WOLFRAM, SCHEELITE, VANADIUM,  
MOLYBDENITE, ILMENITE, RUTILE,  
ZIRCONIUM and TANTALITE ORESSuppliers of:  
FERRO-ALLOYS & METALS, NON-FERROUS ALLOYS

### RHONDDA METAL CO. LTD.

1 HAY HILL, BERKELEY SQ., LONDON, W.1.

Works PORTH, GLAM.

PHOSPHOR COPPER,  
PHOSPHOR BRONZE, LEAD BRONZE,  
GUNMETAL, BRASS

Telephone: MAYFAIR 4654

Cables: RONDAMET

### BARNET NON-FERROUS METAL CO.

Elektron House, Brookhill Road, New Barnet, Herts.  
Phone: Barnet 5187 and 3901STOCKISTS OF: Aluminium, Brass and Copper  
BUYERS OF: all non-ferrous scrap

The RIGHT firm to deal with

### ROURA & FORGAS, LTD.

Telephone No:  
GERRARD 9641

Sole Sterling Area Suppliers of

### ITALIAN QUICKSILVER

PRODUCED BY MONTE AMIATA, S.M.P.A.

COLQUHOUN HOUSE,  
27/37 BROADWICK STREET, LONDON, W.1METAL  
SUPPLIES  
*Ltd*

Suppliers of

COPPER  
REFRIGERATOR  
TUBING  
and all other  
NON FERROUS TUBING

72 VICTORIA ST. LONDON S.W.1

Phone: VICTORIA 1735 (3 lines).

'Grams: METASUPP, WESPHONE.

# WANTED TO BUY

## Complex Ores & Concentrates AND Mill & Smelter By-Products

CONTAINING

NICKEL	COPPER
COBALT	ZINC
TUNGSTEN	LEAD
MOLYBDENUM	BISMUTH
SELENIUM	OTHER METALS
FLUE DUSTS	

## Fred H. Lenway & Company, Inc.

112 MARKET STREET

SAN FRANCISCO 11, CALIFORNIA

CABLES: LENWAY

## ECONOMICS OF SOUTH AFRICAN GOLD MINING

by

R. E. WALLACE and A. S. ROBERTSON

With illustrations by JOHN L. TURNER

THIS book (now available for the first time at a "popular" price) has been specially written for the non-technical mining investor by two Johannesburg accountants in collaboration with a geologist and a mining engineer. It explains how to make full use of the wealth of geological, mining and statistical data, published monthly and quarterly, by the South African groups.

Such information, which is almost invariably reported and commented on in the financial and mining press, often presupposes a degree of knowledge not only of geology and of the techniques of prospecting and mining but also of the limits of economic mining and of the mathematics of share valuation, which many investors do not possess. It is this knowledge which *Economics of South African Gold Mining* supplies.

This book tips no shares, nor does it set out to evaluate the prospects for any particular mine. Its sole purpose is to present the essential background knowledge without which a considered view of this or that South African gold mining share is not possible. It does so in terms which the lay investor can understand, yet in sufficient detail to enable him to put the principles involved to practical use.

PRICE 12s. 6d.

## COSMO METAL ALLOYS CORPORATION

ESTABLISHED 1895

### ORES - MINERALS METALS - SCRAP

Special Alloys and Residues containing Nickel  
Cobalt - Tungsten - Molybdenum - Vanadium  
Cadmium - Bismuth - Selenium - Precious  
Metals

#### FERRO ALLOYS

U.S. EXCLUSIVE REPRESENTATIVE OF FOREIGN MINING COMPANIES

PROCESSORS OF RADIO NICKEL SCRAP AND  
ALL GRADES OF NICKEL ALLOY SCRAP  
AND RESIDUES

Office: 150 Broadway, New York 38, N.Y.  
Plant: 597-603 Kent Avenue, Brooklyn, 11, N.Y.  
Cable Address: 'EDELORIOUS'

# Hudswell, Clarke locomotive turntables

*to meet all Colliery requirements,  
Surface and Underground.*



## BUILT TO ROBUST MODERN DESIGN

### Specification of Illustrated Model —

Gauge of Rails	2' 0"
Total Weight	4 tons 5 cwt.
Height from Base to Rail Top	3' 3"
Outside diameter	10' 0"
Accommodating Locos up to	5' 6" Wheel Base
Time	35 seconds for a 180 degrees Turnabout

**HUDSWELL, CLARKE & COMPANY LTD.**

RAILWAY FOUNDRY · LEEDS 10

Tel: 34771 (6 lines) Cables: Loco, Leeds

LONDON OFFICE:  
120/122 Victoria Street, S.W.1. Tel: Victoria 6786  
Grams: Hudclar, Sowest, London  
Cables: Hudclar, London

